

ROADS AND STREETS

ROADWAY SERVICES
MAINTENANCE
HEAVY CONSTRUCTION

AUGUST 1952

Drill steels do double duty with **TIMKEN®** interchangeable rock bits!

ONE drill steel can do the work of two when you use Timken® interchangeable rock bits. That's because both Timken multi-use and Timken carbide insert bits fit the same threaded steel. You can change them as the ground changes—right on the job!

For ordinary ground, use Timken multi-use bits. Correctly controlled and reconditioned, they'll give you the lowest cost per foot of hole when full increments of steel can be drilled.

Make a quick switch to Timken carbide insert bits when you hit hard, abrasive ground. They're your best bet for maximum speed drilling, small diameter blast holes, very deep holes and constant gauge holes.

Both Timken multi-use and Timken carbide insert bits are interchangeable in each thread series. And each type has these three important advantages: (1) made from electric furnace Timken fine alloy steel, (2) threads are not subject to drilling impact because of the special shoulder union developed by the Timken Company, (3) quickly and easily changed.

Let the Timken Rock Bit Engineering Service help you choose the best bit for your job. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".



your best bet for the best bit
... for every job

TIMKEN

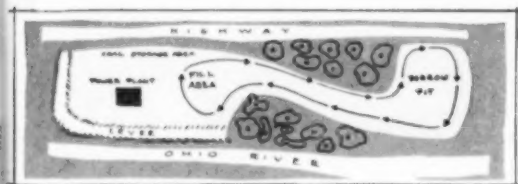
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DRY FEET FOR CINCINNATI POWER PLANT



**3 LPC
MOTOR SCRAPERS**
BUILD 1,500,000-YD. LEVEE TO
PROTECT IT FROM THE OHIO RIVER



It's Another Profitable Job for RICHTER TRANSFER CO., Cincinnati, Ohio

Here's a power plant that will keep dry and operating come Hell or high water, now that it's protected from Ohio River floods. Richter Transfer Co., of Cincinnati, is using three TS 300 Motor Scrapers to build a levee around the Cincinnati Gas & Electric Company's power house at New Richmond, Ohio, right on the river's bank. They are also leveling for a coal storage area adjacent to the power plant. It's a tough operation that calls for the best in earthmoving equipment.

On this job, Richter Transfer Co. is moving approximately 1,500,000-yds. of heavy, wet clay with their three TS 300s. Each Motor Scraper is hauling 50 loads a day on a 6000-ft. cycle, and getting a 15-yd. pay load every trip. Ejection of the sticky clay is no problem with the Motor Scraper's positive forced ejection plus the extra high apron lift. There's no chance for material to jam between the ejector and the apron. Extra power and big tires move the rigs through the heavy fill area without bogging down.

It's no wonder more and more profit-conscious outfits like Richter Transfer Co. are using TS 300 Motor Scrapers for their toughest jobs, because when a rig handles the tough ones easily, it's a profit-producer for every earthmoving job. With TS 300s you get really big capacity... 14-cu. yds. struck and 18-cu. yds. heaped. That means greater pay loads each trip. Speeds in excess of 22 miles per hour mean more trips per hour. Easy loading characteristics and positive forced ejection, plus an 8' 9" front apron opening, cut valuable seconds off the operating cycle. Big power... with your choice of two diesel engines, a 280 HP Buda or a 275 HP Cummins, gives you power to spare in the pit or in the fill, and insures top working speeds at all times.

Whether your job calls for one unit or a dozen, it will pay you to check all the profit-making features of TS 300 Motor Scrapers. See your LaPlant-Choate distributor today.

LAPLANT
MANUFACTURING CO., INC.



CHOATE
CEDAR RAPIDS, IOWA, U.S.A.



Cable-operated Scrapers in 6-, 8- and 14-yd. sizes for all makes of truck-type tractors.



2- and 4-yd. Scrapers for truck-type and rubber-tired industrial tractors.



Hydraulic and Cable-operated Dozers.



This 66-in. diameter galvanized sheet steel culvert was fabricated from Beth-Cu-Loy copper-bearing steel sheet by the Lane Pipe Corporation, Bath, N. Y.

The contractor was Central Pennsylvania Quarry Stripping and Construction Company, Hazleton, Pa.

66-inch Galvanized Steel Culvert Pipe below a 64-foot Fill...

Culverts made of galvanized sheet steel are doing a big drainage job on some of the country's most important projects. And they are doing it economically.

The culvert pipe shown here is 66 in. in diameter, 340 ft long, and it lies under a 64-ft fill of rock and earth. It is located just south of New Cumberland on U. S. Highway 111, near the point at which this highway crosses the Eastern Extension of the Pennsylvania Turnpike.

There are several reasons why culvert pipe made of galvanized steel is selected for jobs like this. Galvanized steel pipe weighs less per foot and has higher tensile strength than pipe made from other materials. It can be fabricated in longer sections. It requires no special equipment for lifting or handling. Its longer sections call for fewer field joints.

Bethlehem does not fabricate culvert pipe, but does manufacture Beth-Cu-Loy galvanized steel stock used by culvert pipe makers. This steel contains 0.20 to 0.30 pct copper, and it meets the specifications set by the American Association of State Highway Officials.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation



**BETH-CU-LOY
GALVANIZED
CULVERT SHEETS**

ROADS AND STREETS

August, 1952 • Vol. 95 • No. 8

Roads and Streets represents 60 years of continuous publishing in the highway field; combined with Engineering & Contracting and Good Roads Magazines, established in 1892

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Publisher



HALBERT P. GILLETTE, Chairman of the
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Coming Articles

High-Speed Scrapers Place Million-Yard Fill

Heavily compacted embankment for high-level reservoir bridge approach, being completed in remarkably short time on this Virginia relocation.

What's Answer for Heavy Traffic Loads Today?

Pavement reconstruction projects in Virginia, West Virginia, North Carolina and other states—showing varied approaches to this problem—will be described in coming issues.

What Traffic Paint Lasts Longest in Service?

Research in plastic paints by investigators at Texas A & M College Engineering Experiment Station throws important new light on this major problem. See report soon.

More Contractor Job Reports Coming

Some of the nation's roadbuilders have highballed this year. Interesting methods will be reported in several outstanding summaries.

Snow Removal Problems and Practices Examined

How an eastern state handles this job on which commerce, industry and social life depend today.

Also . . .

Seattle's automatic signal hook-up—Nation's largest. . . . How Minnesota gets cooperation of municipalities in paving urban links of trunk routes. . . . How to organize a contractor's data file. . . . High cost of little waits at the shovel in truck operation. . . . How Nebraska and Iowa contractors turned flood fighters last Spring. . . . Maintaining the Alaska Road. . . . How soil-cement methods turned Wyoming's "scoria" into asset.

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundation and grade separations, and to the construction and maintenance of airports.

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"ADAMS — Best Motor Graders we have ever used . . .

and this applies to all types of heavy highway construction—grading, road mixing, scarifying, etc. We find the Adams has more weight for increased traction, better stability, greater over-all dirt-moving capacity and plenty of power to handle all jobs easily." So reports Northwestern Engineering Co., Denver, Colorado.

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*Make your next
motor grader an*



Handles 8 jobs in 6 months...

O. L. Depp completes:

- 1 Clarksburg housing project
 - 2 Another housing job at Clarksburg
 - 3 Streets at Massie Subdivision
 - 4 Private roads near Owensboro
 - 5 Railroad siding at Owensboro
 - 6 Landscaping for new school
 - 7 Secondary road at Beech Grove
 - 8 Highway grading at Bowling Green
- with D Tournapull**

"Tournapull's flexibility and mobility are great assets on jobs like these, where duration is short, travel distances often considerable, and time of great value," says Contractor O. L. Depp of Owensboro, Kentucky.

Depp should know the advantages of D Tournapulls because he's handled many of his scattered jobs during the past months with this machine. Here's his Tournapull's record for a typical 6-month period:

18 m. p. h. job-to-job

Starting at Clarksburg, Tennessee, the "D" self-loaded and stripped 8" of topsoil for two 40-acre, 100-unit housing projects. This work completed, operator drove the rubber-tired rig over main highways to Owensboro, Kentucky — 110 miles in 6 hours. Here, "D" graded streets, driveways, and dug drainage ditches for Massie Subdivision.

In quick succession, Depp then sent his versatile Tournapull out on 3 local operations. First, it constructed 2 miles of roads in a nearby private recreational area . . . then built a 1400' railroad

HIGH - SPEED, RUBBER - TIERED
EXCAVATING • HAULING • LIFTING EQUIPMENT





siding for limestone stockpile and distribution . . . finally, the D Roadster landscaped and graded grounds for a new city school in Owensboro.

60 to 80 yds. on 900' haul

Next, the "D" was used at Beech Grove where it helped construct 3 miles of rural secondary road. Contractor Depp estimated his Tournapull averaged 60 to 80 pay yards per hour on 800' to 900' hauls on this job . . . a rate of production which helped finish the work well ahead of schedule. Then, the busy "D" drove 82 miles through traffic to a road grading and construction job at Bowling Green, its last project in this 6-month period. With over 800 hours of time on the 8 jobs, the "D" was 95% mechanically efficient.

Put Tournapull's profitable efficiency, versatility, and mobility to work for you. See your LeTourneau Distributor for job-proved facts and figures pertaining to your type of operation. Better still, ask him for a demonstration of the "D" on your job.

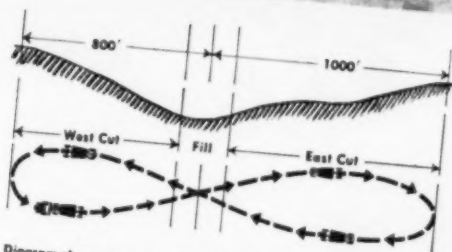
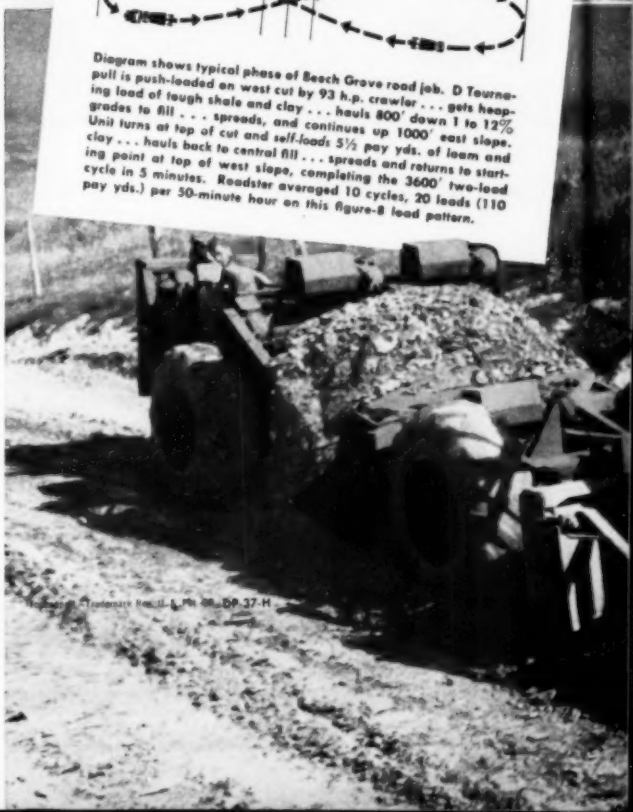
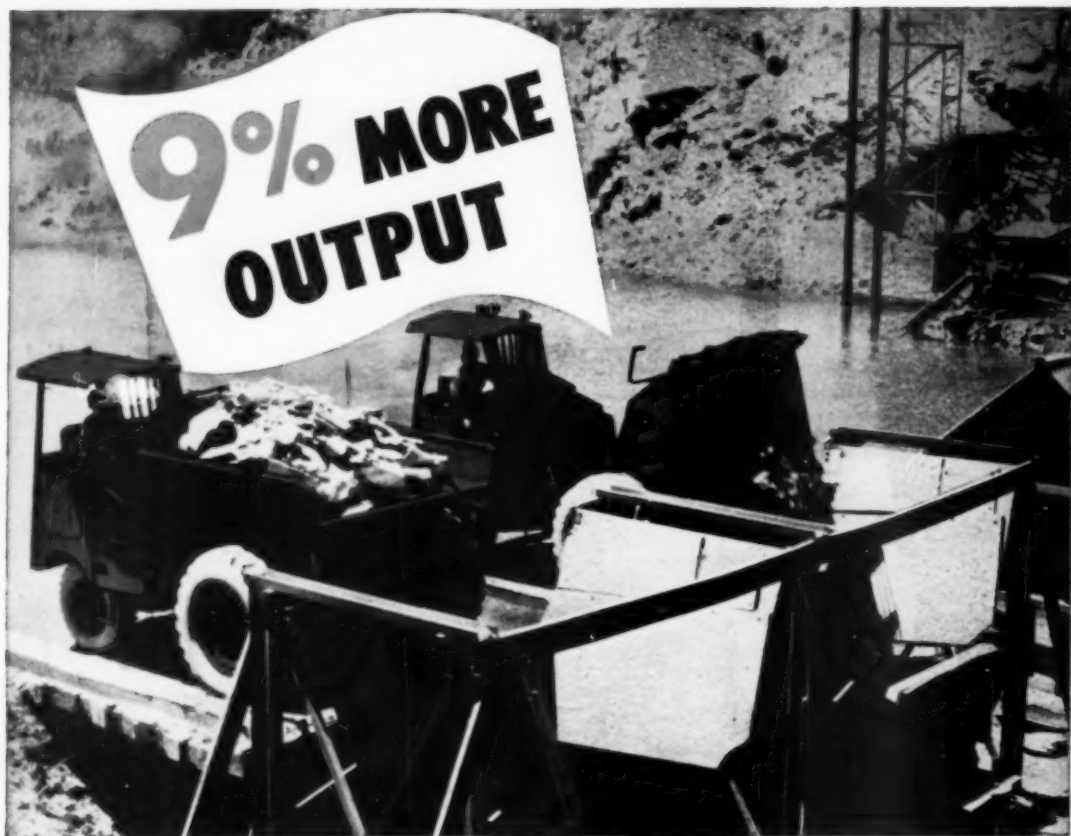


Diagram shows typical phase of Beech Grove road job. D Tournapull is push-loaded on west cut by 93 h.p. crawler . . . gets heap- ing load of tough shale and clay . . . hauls 800' down 1 to 12% grades to fill . . . spreads, and continues up 1000' east slope. Unit turns at top of cut and self-loads 5 1/2 pay yds. of loam and clay . . . hauls back to central fill . . . spreads and returns to start- ing point at top of west slope, completing the 3600' two-load cycle in 5 minutes. Roadster averaged 10 cycles, 20 loads (110 pay yds.) per 30-minute hour on this figure-8 load pattern.



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Peoria, Illinois



...with 1-SECOND GRAVITY DUMP

IT takes just one second to dump a full 6-yard load with Koehring heavy-duty Dumptor. Operator trips the body release lever and gravity instantly tilts the scoop-shaped body 70° . . . one second later the body is empty, and Dumptor is on its way back for another load. Because there's no waiting for slow-acting body hoists, Dumptor saves 15 to 25 seconds every dump. This adds up to important gains in yardage output. At 16 trips per hour on a 1,000' haul, 20 seconds dump-

ing time saved on every cycle gains 5.3 minutes more productive haul-time . . . adds 9% to hourly yardage output.

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Newton, Iowa



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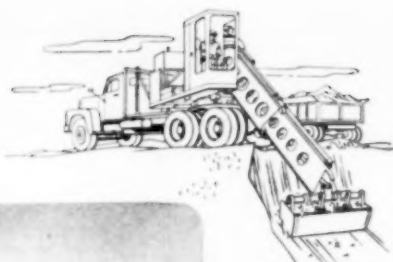
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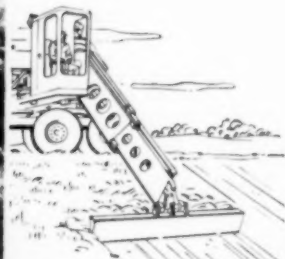
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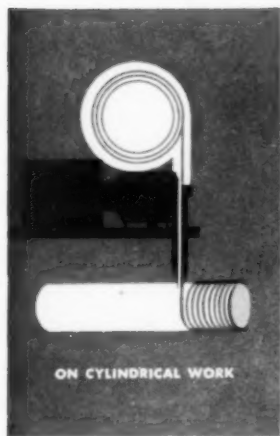


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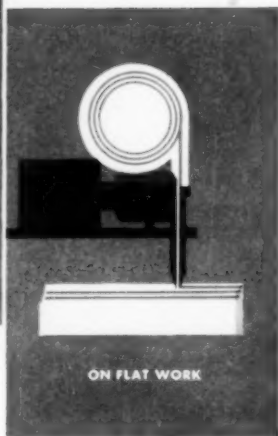
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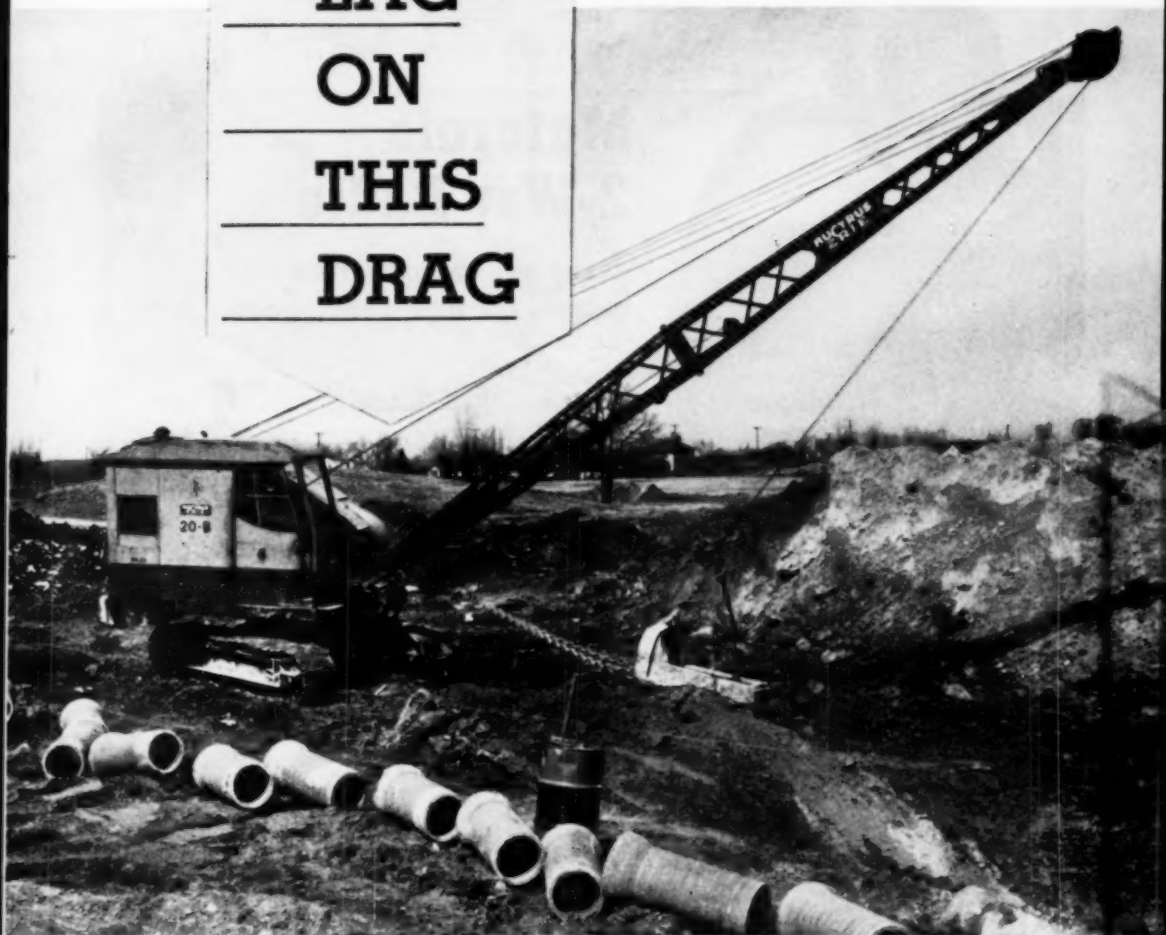
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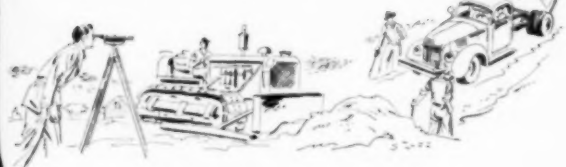
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DIESEL ENGINES
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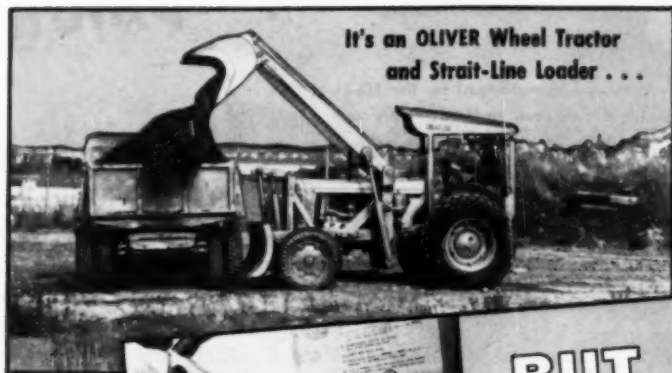
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push this
little lever...



and you have a wheel-dozzer
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BUCYRUS-ERIE CO., South Milwaukee, Wisconsin

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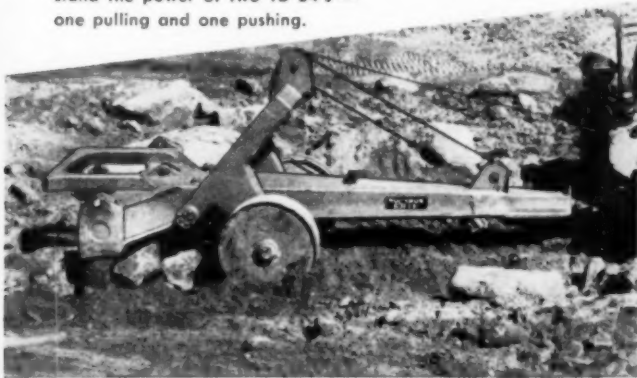
for International TD-24 Tractors

Choice of Three TD-24 Blades: The Bullgrader (shown) features three blade positions plus vertical tilt. The Bulldozer has straight across blade position. The Tilting Bulldozer has straight across blade with vertical tilt.

Two Power Control Winches: The double-drum rear-mounted P-29 (seen in the scraper view) and the single-drum front-mounted P-15 (shown with the Bullgrader).

The CR-4 Ripper is designed to withstand the power of two TD-24's — one pulling and one pushing.

12T52C



Four Pusher Plates: One mounts directly on tractor frame (shown here). Others mount on Bullgrader frame, Bullgrader blade or Bulldozer blade.



See Your International Industrial Tractor Distributor

“Dirt-movin’est tractor I ever saw!”



BIG RED CHAMPS! The TD-24a with 148 drawbar horsepower do more work per day—they have more horsepower and speed than any other crawler on the market. And they have Planet Power Steering, for pivot-turns, feathered-turns or turns with power on both tracks!



Big Red TD-24s distinguish themselves building levees to control Missouri River



GOVERNMENT INSPECTOR, George Lemp, talks it over with prime contractor Paul Crawley (right).

Near St. Charles on the Missouri River, the levees failed against the flood of '51. But Paul Crawley rebuilt them so they stood firm against the worst the river could do in 1952.

Crawley's contract called for moving 940,000 cubic yards of dirt. A big job, a tough job, in the bitter dead of winter. And for Crawley's money, the International TD-24s proved to be real Champs.

"They're the dirt-movin'est tractors I ever saw," he reports. "There's no other crawler to compare with 'em for daily work production!

"They climbed the levee with full loads with no special ramps of any sort. They'd dump their loads, turn around on the 8-foot crown and go back down for another load. It was work that called for superior power and steering, and my TD-24s had it!"

Get the low-down on TD-24 performance from your International Industrial Distributor. You'll be a TD-24 man yourself from then on in!

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS

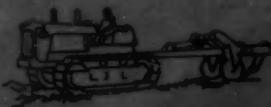


CRAWLEY'S CRAWLERS did the job in a sea of winter mud that froze from time to time.



INTERNATIONAL

POWER THAT PAYS

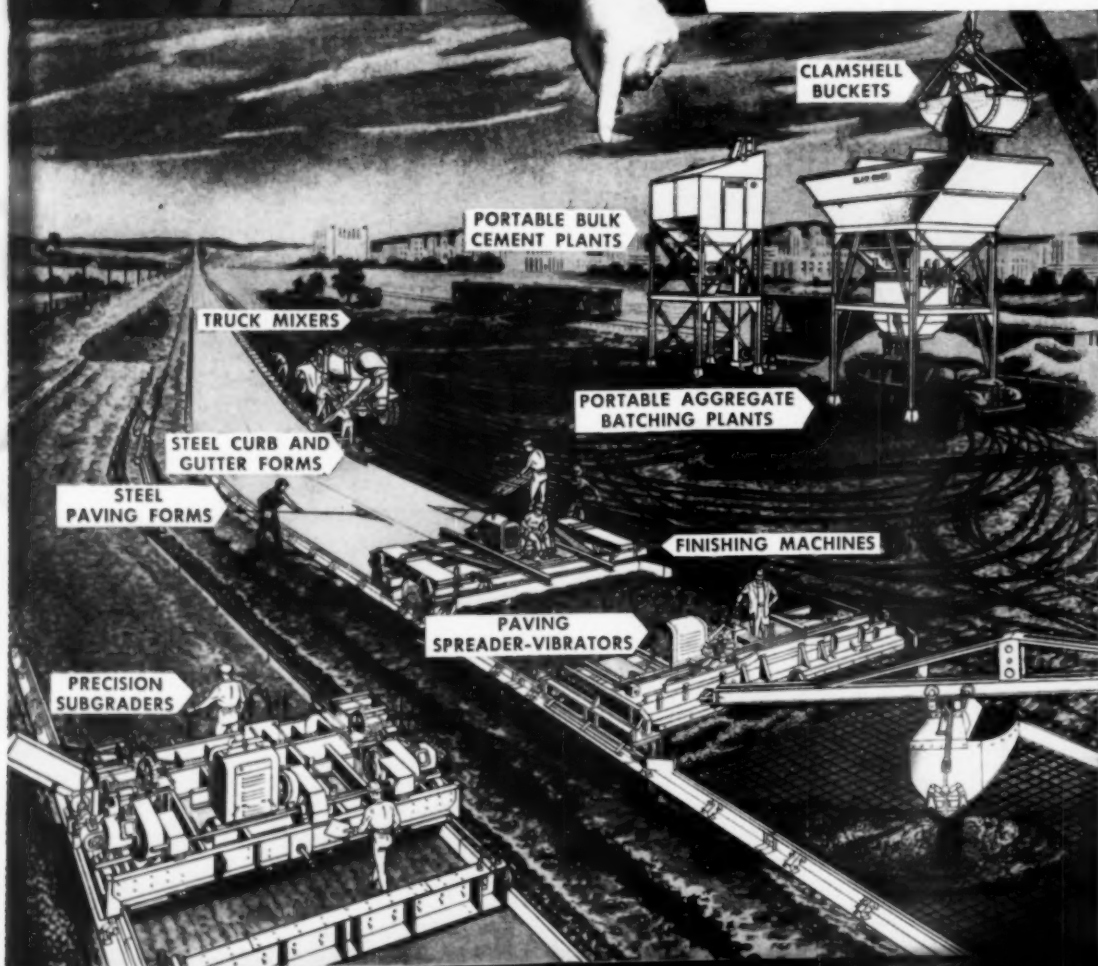


I'M READY

for any concrete
paving job with my

BLAW-KNOX

"COMPLETE PACKAGE"

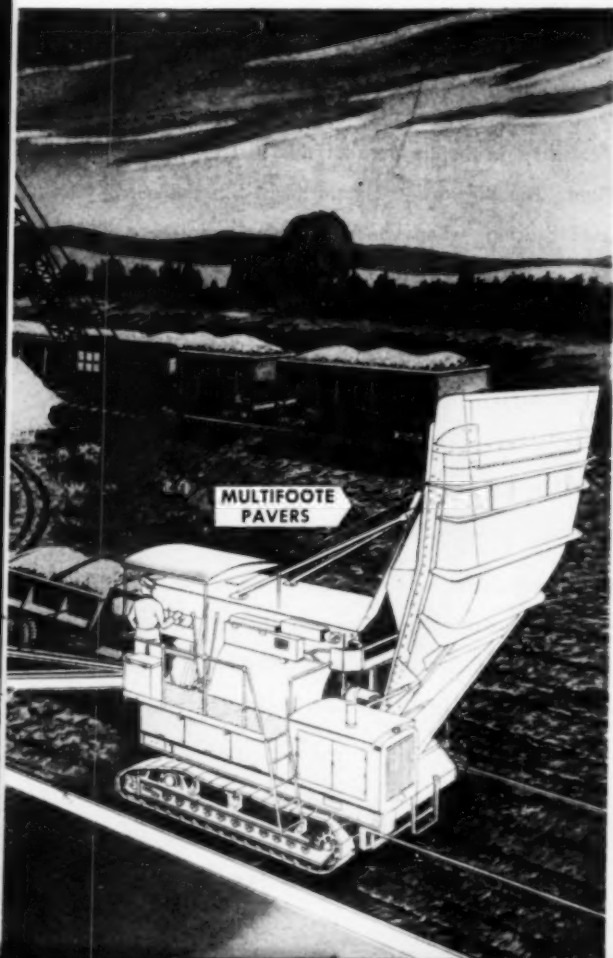


Superhighways, airports, even dams, bridges, buildings . . . when they're built with concrete, they're duck soup for my Blaw-Knox "Complete Package".

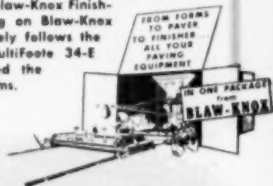
Costs are kept to the absolute minimum! The "Complete Package" contains every piece of equipment needed to assure a steady, balanced production flow with low-cost assembly-line efficiency. The job is 100% mechanized, from handling materials to finishing the slab.

Other reasons why I can operate at lower cost are the "one-source" advantages my Blaw-Knox package gives me. Production steps along at a profit-making clip because wherever I'm working, I can get parts and expert service fast for *all* my equipment, from the nearest Blaw-Knox distributor. Just think—one Blaw-Knox Service Engineer takes care of everything. The entire package is backed by *one* construction-experienced manufacturer who is interested in my success. There's only one financial contact, too . . . that eliminates a lot of bookwork headaches.

With my Blaw-Knox "Complete Package", there's one thing I'm sure of. When the big, juicy contracts come up and they need a man with all the equipment to set up a low-cost job, *I'm ready!*



Blaw-Knox "Package" equipment on the Edens Expressway near Chicago. Blaw-Knox Batching Plants for aggregate and cement were used to insure accurate batching. The Blaw-Knox Spreader with vibratory pan attachment assured satisfactory and economical placement of the low-slump, air-entrained concrete. The Blaw-Knox Finishing Machine, also riding on a Blaw-Knox Steel Paving Form, closely follows the Spreader-Vibrator. A Multifoot Paver placed the concrete between the forms.



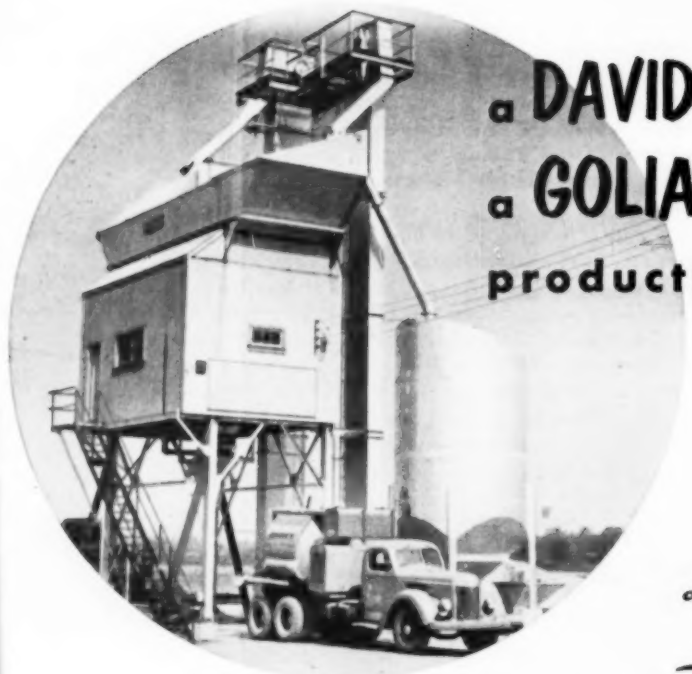
BLAW-KNOX

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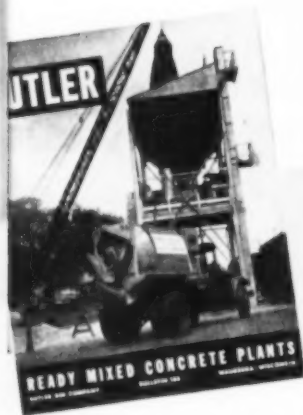
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a **DAVID** in size ...
a **GOLIATH** in
production ...



Remarkable portability is the keynote of this BUTLER Ready Mixed Concrete Plant. The 85 yard 4 compartment bin ships in one piece. Legs and bracing, when knocked down, complete a load for one flat car or low-bed trailer. A second load is made up of elevator, batchers and one-piece overflow cement bin. Erection is quick and easy with a crane and 3 men.



A number of portable BUTLER Ready Mixed Plants as well as many installations of BUTLER engineered design are shown in Butler Bulletin 185. Write for your copy today.

Portability makes location at your job site practical; eliminates a large investment in costly truck-mixers. And with well co-ordinated delivery of materials either to crane, belt conveyor or elevator — production will be equal to the usual Goliath-like plant.

As a permanent installation in small communities — or as multiple unit installations strategically located in and around metropolitan areas, the plant's versatility in production and the low investment required means lower cost per cubic yard and a correspondingly greater profit.

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4-wheel drive **PAYLOADER®**

It takes traction in all kinds of going to get jobs done on schedule . . . traction you can rely on the year 'round . . . that handles big loads quickly, easily and economically.

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WRITE for catalog on the 1½ yd. Model HM or the six other "PAYLOADER" sizes down to 12 cu. ft. bucket capacity.



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LIMA truck cranes are engineered not only for the made-to-order jobs, but with extra-capacity for the unusual jobs. Typical is the way this Lima 34-T, with 100' boom and 20' jib, hoisted this 24' x 22' x 8' steel tank to the roof of a Columbia, S. C. building. Though the weight was 12,650 lbs. and the height 108' the LIMA Crane made it possible to handle this tough assignment with ease and precision.

It's on jobs like this that owners and operators appreciate the stability, maneuverability and smooth, easy control of LIMA 34-T Cranes. Their unparalleled stability permits the use of long booms at low angles and extra-high reaches with jib attachments.

Built with crawler, truck or wheel mounting, LIMA Cranes have travel speeds that range from 1 mph to 31 mph depending on mounting. Rubber-mounted machines have capacities up to 35 tons depending upon the type, and are available with crane, dragline or pullshovel front ends. Baldwin-Lima-Hamilton Corporation, Lima-Hamilton Division, Lima, Ohio.

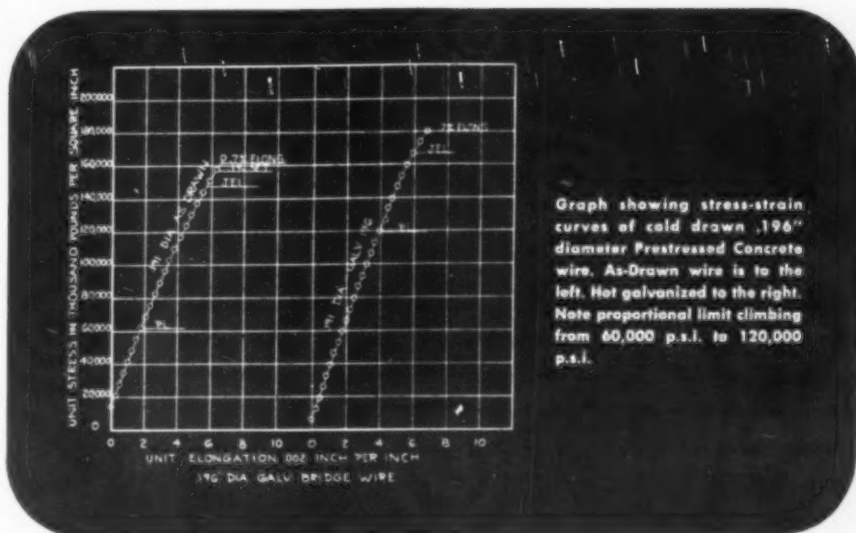


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SURFACE PROTECTION is *not* the chief reason to specify hot-dipped galvanizing on your post-tensioned Prestressed Concrete projects. It's true that this method gives the best protective coating against corrosion. More important, however, hot-dip galvanizing of the acid steel relieves the wires and raises their elastic properties considerably above those of cold drawn wire.

This wire permits the use of design-tension stress of 120,000 p.s.i. Used at this value, you are always working in the elastic range of the wire itself. And we can guarantee absolute stability with no relaxation of the steel... your assurance of safety for the life of the structure.

Each length of Roebling Prestressed Concrete Strand is made into an assembly at the factory with the use of specially designed fittings. Each fitting develops the full breaking strength of the strand without exceeding the yield point of the material in any part of the fitting. Each assembly is then proofloaded in excess of the recommended design-tension stress.

At the construction site the use of an inexpensive hydraulic ram brings the strand assemblies to stress in minutes, cutting the on-the-job labor costs to a minimum.

And you never need worry about costly take-ups either.

Strand for post-tensioning is just one of a full line of Roebling Prestressed Concrete products. Wire and strand for *pre-tensioning* are made of high tensile acid steel that results in exceptionally high elastic characteristics. They are specially treated to greatly increase their bonding quality, too.

We manufacture our own prestressing materials. We know they will deliver all we promise and more. Get the facts and figures on Roebling Prestressing materials. Write Prestressed Concrete Department, John A. Roebling's Sons Company, Trenton 2, New Jersey.



Roebling Prestressed Concrete Strand and its specially developed fitting which are available in a complete range of sizes from 3/8" to 1-9/16". With an inexpensive hydraulic ram, assemblies such as these can be brought to stress in a matter of minutes.

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"Specs" can't begin to tell the story
—we invite you to

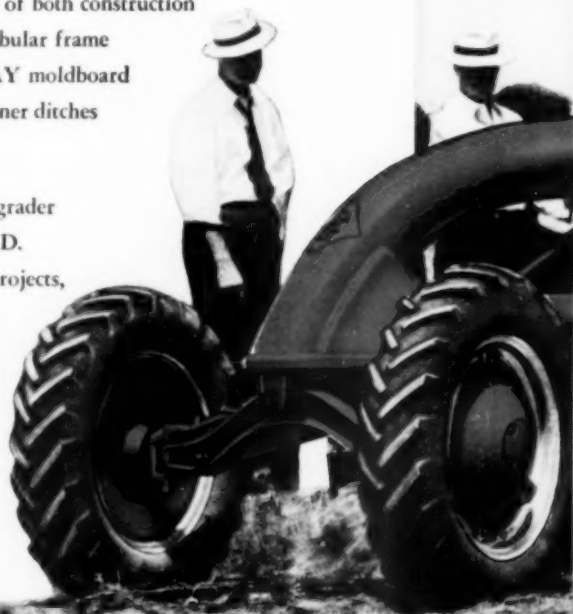
See the model D

Only by watching the Model D *at work* will you believe that a grader costing so little can do so much . . . and that's just what your Allis-Chalmers dealer wants you to do. See how tandem drive design with engine over the drive wheels helps the "D" do a better job of both construction and maintenance. Look closely at how that tubular frame absorbs shocks . . . and how the ROLL-AWAY moldboard enables it to move bigger windrows . . . cut cleaner ditches . . . maintain more miles per day.

Yes, even if you've always been a heavy-grader man, you owe it to yourself to see the Model D. It's *all grader* . . . handles *all* jobs on *some* projects, *some* jobs on *all* projects. So let your nearby Allis-Chalmers dealer give you a working demonstration *soon*.

ROLL-AWAY is an Allis-Chalmers trademark.

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- ★ Four speeds forward to 25.6 mph.
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for the money"

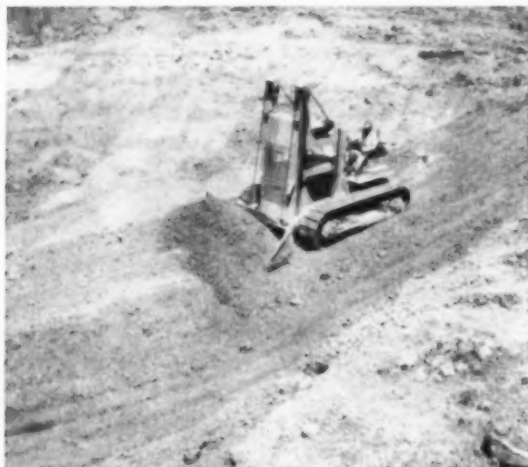


ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



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General Contractors, St. Louis, Missouri
...IN PRODUCING PIT MATERIAL FOR
ELECTRIC POWER PLANT CONSTRUCTION!



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Removing 6 feet of damp, red-clay overburden, called for big, sure-footed power—the T7 TRAXCAVATOR Shovel had it. With over 21,000 pounds of push, the T7 heaps its 2½ cu. yd. bucket in 20 seconds ... pushes the load 300 feet in 70 seconds ... dumps and is back for another in 40 seconds—to move over 75 yards an hour!

STOCKPILING...

The uncovered gravel—1" rock with clay binder—is 'dozed 200 feet down a 5% grade by a T6 TRAXCAVATOR Shovel. 2½ to 4 cu. yds. pile up before the bucket. At the base of the slope the T6 puts the material into 8-foot stock-piles. Cycle time: 110 seconds!

LOADING...

An HT4 TRAXCAVATOR Shovel takes over—loads sixteen 5 and 7 cu. yd. trucks each hour. High-lifting bucket easily clears big dump bodies. Material is being used in the construction of a huge electrical generating plant in Southern Illinois.

There's a TRAXCAVATOR Shovel to do your jobs, too—and do them at a cost so low that profits are insured! See your "Caterpillar" Dealer for full details or write direct.

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TRAXCAVATOR SHOVELS
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MORE CONTRACTORS DO MORE JOBS WITH **LORAIN** Moto-Cranes



BIG LIFTS

BY MOTO-CRANE

When it's a BIG lift, it's a job for the mighty 45-ton Lorain MC-824 Moto-Crane — World's Largest Crane on Rubber. Here it handles concrete pipe sections weighing 24-1/2 tons.

TRAVEL LIFTS

BY MOTO-CRANE

A 25-ton Lorain MC-504W Moto-Crane transports heavy girders and huge plates suspended from the crane boom from unloading point to erection sites.



BULKY LIFTS

BY MOTO-CRANE

These tanks weigh 11 tons each, are 30 ft. long, 10 ft. in diameter... but they weren't too big or bulky for this 15-ton Lorain MC-254 Moto-Crane to unload and spot on the job.



Whenever and wherever there's a load to lift, there's a mobile, high-speed Lorain Moto-Crane to do the job... and lower costs! From 10-ton lifting capacity up to the giant 45-ton MC-824 (world's largest crane on rubber)... you'll find more sizes, more drive arrangements, more selection in the Lorain line of Moto-Cranes... with carriers and turntables designed for each other by the pioneer of the truck-crane idea. That's why more Moto-Cranes are on more jobs today... and why it's so easy for your Thew-Lorain Distributor to show you proof on a nearby job. Ask him for job proof — before you buy!

THE W LORAIN.

THE THEW SHOVEL CO.
LORAIN, OHIO

HIGH LIFTS BY MOTO-CRANE

High up in the air — and with precision spotting — go these 4-1/2-ton steel trusses with a 20-ton Lorain MC-414 Moto-Crane handling the job with ease. Lorain booms with tip extensions can reach as high as 130 feet.



"TRICKY" LIFTS




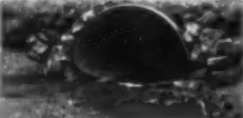

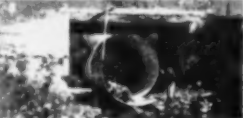





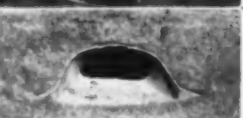
BY MOTO-CRANE

There's hardly a lift a Lorain can't handle. For example, two 25-ton Lorain MC-504 Moto-Cranes team up to handle this awkward load — a kiln weighing 80 tons — unloading and moving 100 yards to foundation.



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Think of the time-saving and convenience of getting all your drainage needs from a single source! The complete line of Armco Drainage Products makes it easy to find a structure for almost every drainage need. Equally important, you gain economy and dependability. Armco Structures have ample strength plus material durability to meet specific conditions. They are light in weight for easy hauling and handling. Labor costs are low. Check this list to simplify your drainage problems.

| PRODUCT | DESIGN | APPLICATION | SIZE RANGE | GAGE RANGE | ADVANTAGES |
|------------------------|---|---|---|----------------|---|
| CORRUGATED METAL PIPE* |  |  | 8" TO 96" | 16 TO 8 | Long, lightweight sections; easy assembly with coupling bands; proved strength. |
| CORRUGATED PIPE-ARCH* |  |  | 18" x 11" TO 72" x 44" | 16 TO 8 | Sturdy construction; provides fast runoff under limited headroom. |
| MULTI-PLATE PIPE |  |  | 60" TO 180" | 12 TO 1 | Pre-curved plates designed for field assembly. Nestable, easy to handle. |
| MULTI-PLATE ARCH |  |  | SPANS — 5' TO 30' | 12 TO 1 | For new small bridges; relining or extending existing structures. |
| MULTI-PLATE PIPE-ARCH |  |  | 6'5" x 4'9" TO 15'9" x 9'7" | 12 TO 1 | Combining advantages of MULTI-PLATE and PIPE-ARCH under limited headroom. |
| END SECTIONS |  |  | PIPE — 12" TO 48" PIPE-ARCH — 18" x 11" TO 72" x 44" | 16 TO 12 | Simple, low-cost end finish; increases efficiency; improves appearance. |

*Specify ASBESTOS-BONDED for severe corrosion and PAVED-INVERT Pipe for erosion.

Write for more information on any of these products. Just mention the products that interest you and if you have a specific problem tell us about it. Armco Drainage

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Armco Drainage Structures





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Yes... "QUICK-WAY"... the original and always the standard among truck shovels, demonstrates its versatility and adaptability, as well as its superb engineering and long-lasting construction, in Alaska and the Amazon, Great Britain and British Columbia.

Abroad, as well as at home, "QUICK-WAYS" get to and from the job faster. They're on the job more, because they're "between location" less. And "QUICK-WAYS" are quickly convertible—an attachment for every job, with four booms, shovel, scoop, trench hoe and crane. As a dragline, clamshell, pile driver, magnet or hay fork "QUICK-WAYS" are fast moneymakers. Crane hook, concrete bucket and other special tools are available. Four models from 3 to 10 ton crane capacity. And most important of all, "QUICK-WAYS" are built for long, hard service with quality materials and superior workmanship. They're truly an investment in profits.



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Please send me complete details on "QUICK-WAY" truck shovels — four different models for large jobs and small.

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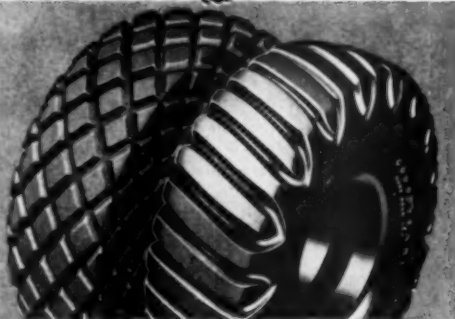
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Sure-Grip in name, sure-grip in action—that's why this long-lasting Goodyear tire is the top favorite on earth-moving operations everywhere for drive wheels. Its specially engineered O-P-E-N C-E-N-T-E-R tread and extra-massive, balanced lugs are what make it the traction champ. *And cost-wise construction men know it.*



**There's a Cost-Cutting
Goodyear Tire For Every Job**

ALL-WEATHER

Finest for flotation,
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HARD ROCK LUG

Super-tough champ for
all kinds of rock work

Sure-Grip, All-Weather—T. M. 's The Goodyear Tire & Rubber Company, Akron, Ohio

GOOD YEAR

MORE TONS ARE HAULED ON GOODYEAR TIRES THAN ON ANY OTHER KIND

Editorial

What Makes a Contractor Succeed?

The article "Why Contractors Go Broke" in this issue throws some light on the even more fascinating question: Why do contractors *succeed*?

The editor's mail today contained a letter which started a train of reflection on this point. One of our biggest and most successful contractors recently used a novel method on a job, involving the mechanical fine-grading of an embankment slope to be paved. While not a completely new method, it was at least novel, and no doubt saved considerable time and money on the job at hand. When this company was asked to furnish a snapshot illustrating the technique, an employee replied, "Due to the fact that this was an original idea which proved of value to the operation, I do not believe that we would care to have this particular phase of the job receive undue emphasis. I am sure you will understand our position in this respect."

Just how important is it for a contractor on public works construction to try and keep his field methods exclusively to himself? We venture the belief that this particular contractor's outstanding growth and success are due, not to any such secrecy, but rather to all-around good management. A chief technique of good contractor management is the one of constantly devising and applying resourceful methods on every job. The crux of the management skill in this realm is in knowing *when* to use a given method as part of over-all planning and supervision. By the time a competitor learns about a new method and finds an opportunity to utilize it, the originator is through with the particular job, and has moved on to the next job with its entirely different problems and opportunities for short cuts and improvisations.

All of which is assuming that a method put to work out in the open can be kept secret, which of course it cannot.

Actually contractors have more to gain than to lose by the free exchange of job methods. Roadbuilding and construction methods have evolved mostly through thousands of little advances. These have come along, job by job, under the spur of profit, and as tools of close competitive bidding in the case of publicly financed projects. Progressive construction men realize that this evolution will go on indefinitely, with engineering designers, specification writers and administrators working with machinery manufacturers and contractors to advance the art and science of construction.

The automotive and aircraft industries are also ex-

amples of industries which have advanced through inter-exchange of plant methods and design developments.

Knowing that the competitive advantage of any one new field kink or procedure is a fleeting one, most contractors have shown a readiness to cooperate with construction editors, as well as with each other. The best of them always have their minds on the job ahead of the one they are doing, with its new opportunities to dust off old tricks and new and turn them into profit.

Often a new method is available for all to use, but only the most progressive and alert grasp and quickly put it to work. A southern contractor, for example, is believed to have "cleaned up" a few years back, by buying a new stabilizer—a machine any contractor could have bought—and promoting and low-bidding two hundred miles of jobs in one season because he saw its efficiency possibilities.

Attend the Engineering Centennial

The Centennial of Engineering to be held at the Conrad Hilton Hotel in Chicago, September 3 to 13, offers a rare opportunity for engineers. This unique gathering, expected to bring together the largest congregation of technical men in engineering history, is tied in with celebration of the founding in 1852 of the American Society of Civil Engineers. Its broad theme is what free enterprise has accomplished in America through a century of engineering. The ASCE is but one of 37 engineering societies participating in the 11-day-long program, which will include a thousand speakers.

Beginning on Wednesday morning, September 3, the Highway and Construction Divisions of ASCE will hold a joint session. Then Friday, the 5th, there will be a morning, luncheon and afternoon session of the Highway Division alone. Also of special interest to *ROADS & STREETS* readers are other sessions by the Air Transport, City Planning, Soil Mechanics and Foundations, and other divisions of the ASCE, all open to non-members as well as members.

This is a mighty busy time of the year for highway engineering and contracting people. It is hoped, nevertheless, that many can break away for a time to be in Chicago. Government departments and private employers alike should take all possible steps to give time off for personnel wishing to attend.

IT COSTS LESS TO BUILD GOOD ROADS THAN TO HAVE POOR ROADS

Why Contractors Go Broke

By George W. Grupp

Special to Roads and Streets

CONTRACTOR failures in the 4 years 1949, 1950 and 1951 were at a high rate. They were at the rate of more than two failures per day with an average daily total liabilities in excess of \$83,000. In the period from 1940 to 1951 inclusive there were 6,388 contractor failures with total liabilities amounting to \$166,212,000. Out of this grand total 2,707 failures with \$90,369,000 in liabilities occurred during the past three years. And if this year's rate of failures continues as it has during the first three months, the year 1952 will end up with 840 contractor failures with liabilities totaling \$28,000,000.

Bidding Errors

This year about 20 contractors, (some inexperienced contractors, and some well established firms), asked the Navy Department's Bureau of Yards and Docks to release them from their contracts because of errors they made in their bids. One contractor stated that he omitted a whole page of cost figures; and another declared that his error was due to a faulty adding machine. One firm claimed it made an error of \$500,000; another said it made a mistake of \$1,500,000; and two others claim they made an error of \$2,000,000 each. These are large and serious errors. No contractor can long remain solvent if he makes such mistakes.

This trend has made bankers, credit men, surety companies, government awarding agents and federal negotiating officers think seriously about what is going on even though they still hold in high esteem the integrity and skill of the construction industry

Can you guess the various reasons? This article is specially timely because of the keen competitions and uncertainties of the present. It takes good business judgment as well as specialized know-how to stay in this rough-and-tumble field. Contractors will read this with a "can this be me?" reaction. Engineers who supervise construction will gain a better understanding of the contractor's problems from reading this summary. Editors.

as a whole.

One might now ask: Is the present trend of failures due to our semi-war economy? To long term contracts at fixed prices? To over expansion of the building industry? Or to shrinkage of available working capital resulting from receivable difficulties, high taxes, and keen competition?

In some instances these may be contributing factors of the underlying causes for failure. But before we deal with the specific causes for contractor failures we will first make a few general observations.

Underlying Factors

Lord Bryce (sometime ambassador to the United States from Great Britain) once said: "The difference between men who succeed and men who fail is not so much as we commonly suppose due to the differences in intellectual capacity. The difference which counts for most is that between activity and slackness; between the man who, observing alertly and reflecting incessantly, anticipates contingencies before they occur, and the lazy, easy-going, slow moving man who is roused with difficulty, will not trouble himself to look ahead, and so being taken unprepared loses or misuses the opportunities that lead to fortune."

Successful contractors like Pat (see anecdote on these pages)

gallop over obstacles like tried horsemen. They know that success is not a theory. They know it is an experience promised on sound knowledge, practiced skill, and aggressive operating management. Successful contractors, like tall trees, look beyond the average to avoid the wrangles, tangles, tie-ups, terrible talking matches and swear fests which are the forerunners of a crash.

Now let us examine the underlying and apparent causes for contractor failures by beginning with the lesser causes.

Disasters, such as fires, floods, and employee frauds, were responsible for 0.5% of the contractor failures in 1950 and for 1.0% in 1951. All of these failures could have been avoided if these contractors had protected themselves against such losses with insurance. These contractors should have recognized that self-insurance is a risky business and that it is usually false economy.

We remember a small contractor who thought it was a waste of money to insure a large barge and its load of specially cut granite while in transit from Newport to Goat Island, R.I.—water route distance 12 miles. Not long after the barge got under way a sudden squall came up. Huge waves broke over the heavily laden barge. To make matters worse she developed a serious leak. And before the tug could deliver the barge to her destination the hawser had to be cut as the barge sank to the bottom of the Bay in over 100 feet of water—a total loss to the contractor, and one which forced him into bankruptcy because he lacked the wisdom of protecting himself with insurance.

Some Fraud Cases

Fraud was responsible for 3.3% of the contractor failures in 1950, and for 3.5% in 1951. Contractors who employ Get-Rich-Quick Wallingford schemes deceive themselves into be-

Construction Industry Failures

First Quarter of 1951 and 1952

| Type of Contractor | Number of Failures | | Liabilities | |
|-------------------------------|--------------------|------|-------------|-------------|
| | 1952 | 1951 | 1952 | 1951 |
| General Building Contractors* | 86 | 74 | \$3,392,000 | \$2,270,000 |
| Building Sub-contractors | 113 | 154 | 3,107,000 | 4,279,000 |
| Other contractors | 11 | 12 | 593,000 | 1,364,000 |
| Total | 210 | 240 | \$7,092,000 | \$7,913,000 |

Source: Dun and Bradstreet

*This classification of Dun and Bradstreet is understood to include some highway and heavy contractors, the word "building" having a broad connotation. Editor.

believing that cheating is not cheating until found out—a premise which has no survival value.

Those contractors who failed because they made false financial statements probably were aware of the ultimate outcome and to soothe their vanity they possibly sang to themselves this little ditty:

"Hush, little deficit, don't you cry;
You will be a crisis by and by."

Premeditated overbuying—deliberate overbuying—is sometimes the cause for contractor failures, but this form of fraud is rarely used by contractors. Most contractor failures under the head of fraud are due to irregular disposal of assets.

Occasionally contractors fail because of specification cheating. We remember a contractor who cheated in the quality of concrete used. The apartment house collapsed and the contractor was burdened with a chain of damage suits which threw him into bankruptcy.

Carelessness Toll

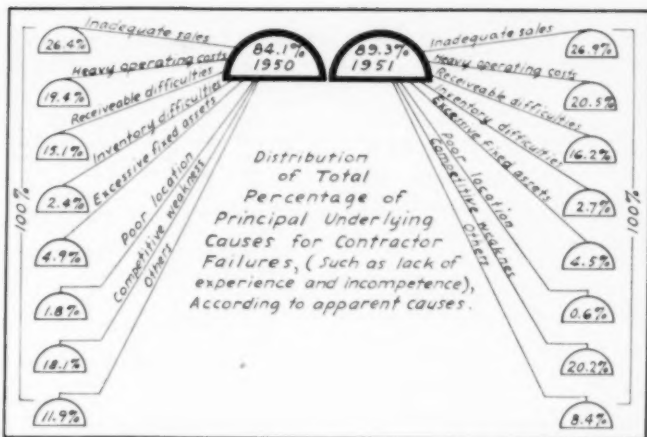
Neglect accounts for 6.3% of the contractor failures in 1950 and for 4.7% in 1951. Neglect is not necessarily the result of inability or lack of experience. Contractors who fail from neglect have permitted themselves to be swallowed in the quicksands of omission, carelessness, bad habits, marital difficulties, and poor health.

We have some sympathy for the contractors who fail because illness made it impossible for them to properly attend to their business. But we frown on the contractors who neglect their business because of extravagant, hysterical, incompatible or disloyal wives. And contractors who neglect their business and fail because of strange women do not deserve sympathy. We remember a once successful member of the construction industry who wrecked two families and ended up in bankruptcy because he became amorous with a female octopus. It is to the credit of the construction industry, however, that very few contractors fail for marital difficulties.

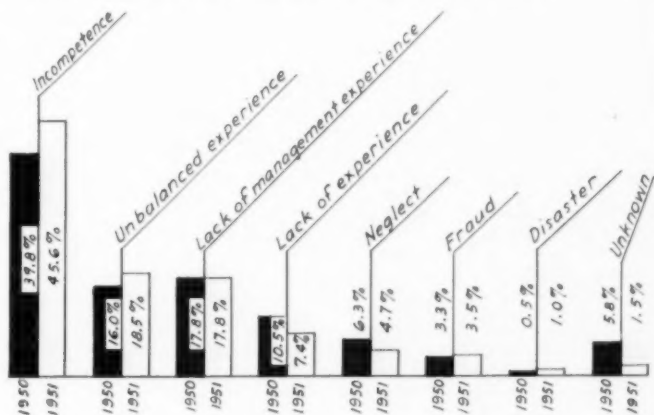
More contractors fail from omission and carelessness due to strong drink, gambling and laziness. Those contractors who failed because of laziness did not recognize that there is no economic advantage in driving an automobile over bumps to knock the ashes off their cigars.

Lack of Experience

Lack of experience, lack of management experience, unbalanced experience, and incompetence were the underlying causes for 84.1% of con-



UNDERLYING CAUSES FOR CONTRACTOR FAILURES

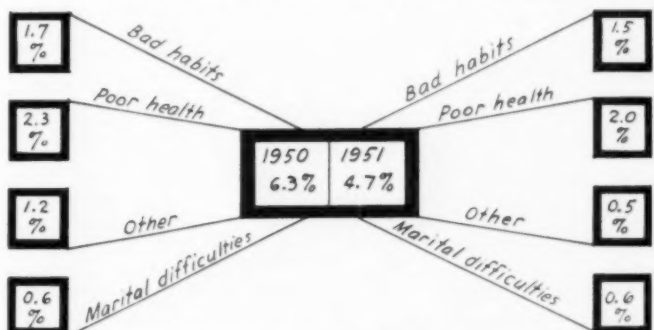


tractor failures in 1950 and for 89.3% of the failures in 1951.

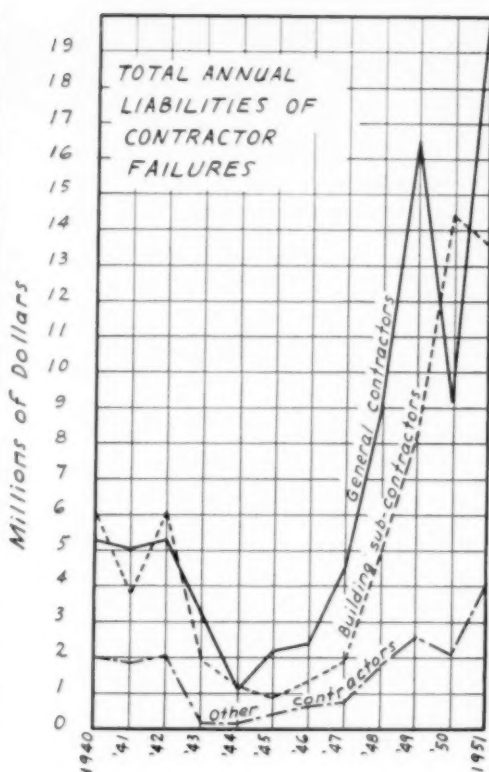
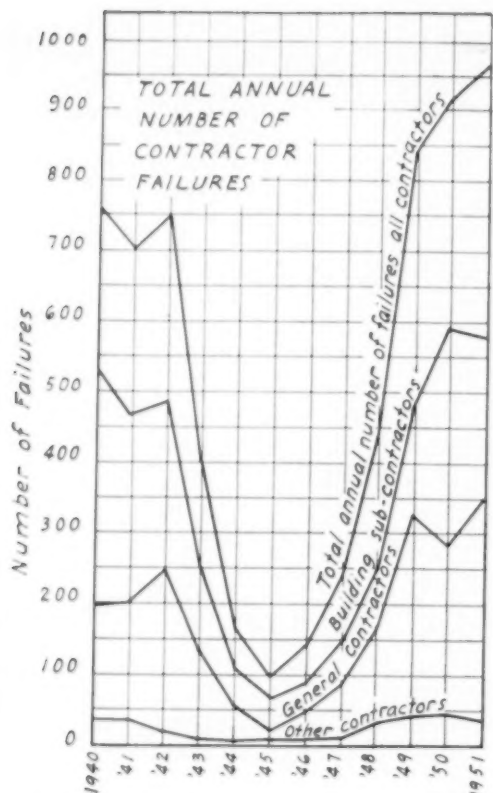
Lack of experience—wanting in knowledge gained from trial and error—was responsible for the least num-

ber of contractor failures under this head.

Ferdinand de Lesseps, who was the successful builder of the sea-level Suez Canal across the desert failed



APPARENT CAUSES FOR NEGLIGENCE RESULTING IN CONTRACTOR FAILURES



to build a sea level canal across Panama because he lacked experience in cutting down mountains of rock in a jungle.

Lack of construction experience in desert, jungle and cold weather areas can reduce successful temperate zone contractors to failures if they are not careful, if they lack the ability to

foresee contingencies, and if they neglect to cooperate with nature and the local construction working conditions.

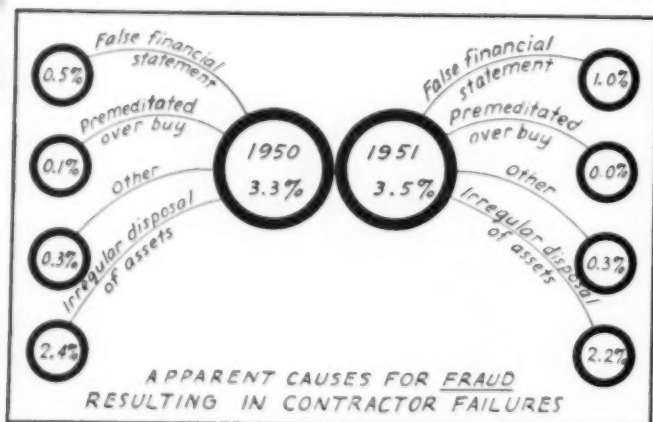
The contractors who failed because of their lack of management experience—experience in skillful and sound administration—forgot that the most important part of a motor car is the

nut on the steering wheel. The best engineers and finest construction equipment are liabilities under poor management.

And the contractors who failed because of unbalanced experience neglected to surround themselves with persons who had the experience which they lacked.

The principal underlying cause for contractor failures is incompetence. And human nature being what it is the more incompetent the persons the greater is their self-deception by stupid presumption. They know little or nothing about required working capital, costs, prices, management, and how to meet competition. They do not know how to set up either cost accounting or financial accounting books which will reveal all pertinent information on short notice. As a result any moderate economic abnormality forces them out of business.

Let us now direct our minds to some of the apparent causes for contractor failures such as poor location, inventory difficulties, receivable difficulties, excessive fixed assets, heavy operating expenses, competitive weakness and inadequate sales.



Aggressive Job-Getting

Inadequate sales are responsible for a large number of contractor failures. No one will doubt that in our semi-war economy control of materials and restrictions on new construction, maintenance and repair work have contributed to inadequate sales—sales which are insufficient for some contractors to utilize to the full their facilities. Inadequate sales are also the result of competitive weakness because it takes more than whisky courage and imagination to succeed in competition.

As already mentioned under the head of incompetence any moderate economic abnormality causes marginal contractors to go out of business, especially in a competitive field. Marginal contractors are always in need of vigor to keep them from falling when on the brink of uncertainty, for the level of price changes have an immediate effect on their business health. And since most construction work is performed by small contractors who bid competitively with profits squeezed to a small margin, any unforeseen extra cost may result in their bankruptcy.

This condition makes it particularly necessary for the engineers and accountants of small contractors to cooperate to the full to set labor standards and to discover improvements which will lower costs.

In meeting competition some contractors remind one of the policeman who noticed a man coming down the street in a barrel.

"What's the idea of the barrel?" the policeman asked. "Are you a poker player?"

"No sir," the man replied. "But I spent a couple of hours with some men who were poker players."

In other words, contractors who are not aggressive in competition and who do not know the construction business soon lose their pantaloons.

When Going Is Tough

When the trainer of a prizefighter was asked: "What is the difference between a good fighter and a great one?" he replied: "When the going gets tough, the great fighter lasts five minutes longer." And when the going gets tough in a competitive field the great contractor has the stuff to last longer.

Some contractors fail because of their heavy operating expenses which are usually due to a lack of aggressive competition; due to excessive salaries, inventories and fixed assets; due to selecting the wrong equipment from the point of utility, productivity, possible utilization and operating and maintenance costs; and due to a lack

The One About the Irish Immigrant

The observation on underlying qualities reminds us of an Irish immigrant who came to New York City in the 1840s. Soon after arrival he sought the aid of Tammany Hall to get a job. They sent him to Public School No. 4 where he was immediately installed as janitor. Two days later the principal pointed to a sign and said to Pat: "I want you to make three signs like that."

Pat grinned and replied: "That's impossible because I cannot read or write," whereupon he lost his job.

He soon hired as a teamster for a mud-dray contractor. Now Pat began to reason that he could engage in this business. But since he did not have enough money to buy a wagon and team of horses he rented an outfit.

Fortune Smiles

Pat worked hard and fortune smiled on him. After some years as a successful

mud hauling contractor Pat reasoned that he would like to build and own a tenement house. But since he needed \$25,000 in liquid capital he made bold to go to a large bank for a loan. The bank president was impressed, but said, "Before we place \$25,000 to your credit, you will have to sign this note." Pat then told the banker he could neither read or write.

"In view of your present success do you have any idea what you might be today if you were able to read and write?" asked the bank president.

With a chuckle Pat answered: "I would be the janitor of School No. 4."

Pat had worked hard. He used to the full what little God gave to him. He looked ahead. He anticipated emergencies. He knew he was ignorant and to make up for his shortcomings he surrounded himself with men who had what he lacked and in doing so he made out of himself a successful contractor.—George Grupp

of knowledge of material and labor wastage costs.

Heavy operating expenses as well as excessive fixed assets, receivable and inventory difficulties, and poor location (all apparent causes for contractor failures), are due to management inaptitude and inefficiency and poor judgment. Such difficulties usually reduce the working capital of contractors and burden them with abnormal depreciation charges and high maintenance and repair costs.

Any Cure?

One might now ask: "What is the cure for the causes of contractor failures?" There is no absolute cure, because the only thing that is constant in human nature is its fickleness. Some heed the signposts that point out that fraud, neglect, lack of experience and incompetence lead to financial disaster, and others in their conceit, stupidity and ignorance refuse to believe the signposts. This

later type, like little children, when warned by their parents not to touch a hot stove are never satisfied until they touch it and burn their fingers.

Trucks Gassed Up Through Flap Doors

The weather-proofed lube trucks shown here is the kind of contractor's rig you are likely to see in the cold country. It is in Minnesota and belongs to Jeffries Construction Company of Mankato, Minnesota. The ROADS AND STREETS editor snapped this picture recently where the truck was set up along the haul pass from the main road into a gravel plant.

Inside this wooden trailer body is a 500-gal. gasoline tank, greasing equipment and a small light plant. Note hanging on the outside corner is a fire extinguisher and also conspicuously posted is a "Danger, No Smoking" sign. This same sign is posted on all four sides of the truck trailer.



★ Doors in rear of this enclosed trailer give access to lubricants and to hose from 500-gal. gasoline tank within



★ Rolling flexible base on Minnesota reconstruction project. Typifying work for previous year analyzed in accompanying article. See note below for details of this project. (Roads and Streets photo, June, 1952)

Base Construction

Reviewed by Minnesota Materials and Research Division

Methods and results analyzed for 63 projects in Minnesota's 1951 state road program—including sand-gravel sub-base, gravel base, soil stabilized gravel base, and crushed rock base

By F. C. Frederickson

Division of Materials and Research
Minnesota Department of Highways, St. Paul

THIS article is taken from a report of the Materials and Research Division, based on a tabular recapitulation of the pertinent data covering 63 base projects built by the Minnesota Department of Highway Construction Division in 1951. The observations are also based on information obtained in contacting the various projects during the construction season.

The full tabulation covering all projects is omitted due to space limitations. Tables here give data only for typical projects referred to in the ensuing paragraphs.

The following is a brief description of the dominant features of the various projects:

New Bases

I. The largest group encompassed

the construction of 6, 9 and 12 in. of base on relatively new gravel or bituminous surfaced grades, many of which are in the secondary system. On many of the jobs, sub-base consisting of Class 4 material was placed followed by the construction of a 3-in. layer of gravel base. (Gradation requirements for Class 3, 4 and 5 materials herein referred to are given in an accompanying table.) Where gravel

was available economically, Class 5 aggregate was used for the full thickness. On some projects crushed rock was used when suitable gravel was not available. Relatively inferior gravel was used for the full thickness on a few projects where higher bearing material was not available economically or was conserved for other purposes.

Referring to the tabulation, State Projects 0112-21, 0507-03, 1109-07, 3415-05, 4103-05 and 4107-07 are examples of this group where the full thickness of base, varying from 6 to 12 in., was constructed with Class 5 base aggregate under the provisions of 2202 of the Specifications (see accompanying explanation of this and other code numbers). On a few of these projects the gradation requirement was modified moderately to permit the use of deposits, located near the project, that contained finer graded gravel than would normally have been used.

In the same group exemplified by State Projects 1403-13, 2604-03, 3101-06, 3604-25 and 6106-07, a sub-base, consisting of sand or inferior gravel, was placed under the provisions of 2201 followed by the placing of three inches of higher bearing gravel under

• Above photo shows base rolling in progress on 1952 Minnesota proj. S.P. 2604-10 (trunk H, 9) between Herman and Morris, Minn. Megarry Bros. of St. Cloud, Minn., contractor. 118,000 tons Class 5 gravel base 3 to 12 in. compacted thickness, constructed to Spec. 2202; 22,190 tons asphalt cement-gravel hot-mix for 1½-in. surface mat. Equipment train pictured includes 3 Bro. rollers drawn by International industrial tractors; 1 Caterpillar No. 12 grader; 2 2,000-gal. sprinkler tanks on International trucks. Final roller pass on freshly sprinkled grade being made on hot day at 6 p.m. to hold the surface overnight under traffic.



★ Arrow shows belt bringing loam topsoil onto gravel belt to blend materials for sand-gravel sub-base, Cedar Rapids aggregate plant of Jeffries Construction, subcontractor under Duinick Bros. & Gilchrist, Project S.P. 4701-08 (Trunk Hy. 4). Typical of Minnesota work this project involves placement of 87,000 tons of Class 4 & in. sand-gravel sub-base; 43,000 tons of Class 5 gravel base (Spec. 2202) 3 in. thick; and a 2 in. road-mix bituminous surface. (Roads and Streets photos, June, 1952)

the provisions of 2202.

On most of these projects it is expected that load restrictions will be applied during the spring "break-up" period.

2. A second group encompassed the construction of 3 to 6 in. or more of base to reinforce existing bituminous surfaced granular bases. This varied from extensive coverage to intermittent reinforcement and extensive correction of localized failures.

Examples of this group are State Projects 0301-04, 0604-10, 2706-14, 6010-08 and 8210-21. On most of these projects, Class 5 base aggregate was used and the base constructed under the provisions of 2202 of the Specifications.

It is expected that load restrictions will be applied in the spring on some of these projects.

Specification Code Numbers Explained

Specification 2116 is a construction specification covering sub-grade corrections and involves the removal of unsatisfactory materials and their replacement with granular materials including depositing, spreading and compaction.

Specifications 2201, 2202 and 2210 cover the depositing, spreading and compaction of Class 4 (sub-base) materials, Class 5 (base course) materials and Class 3 (crushed rock base) materials, respectively. They also include the preparation of the roadbed in connection with such construction.

Specification 2110 covers the placement of embankments in connection with grading construction.

Specification 3138 governs the quality and gradation of gravel, sand and crushed rock materials used in sub-base and base construction.

Concrete Resurface

3. In a third group, the construction consisted of placing base and surfacing on obsolete concrete pavements in rural areas and in towns and villages. This involved widening, grade correction and alignment changes.

Included in this group are State Projects 1806-12, 1914-03, 1916-09 and 7406-04. The base construction generally consisted of placing 12 in. or more of sub-base followed by 6 or 9 in. of gravel base on sections where grade and alignment changes were made. Where base was placed only in the widened portion, 6 to 12 in. or more of sub-base and base was placed followed by 2 to 6 in. of bituminous base. Where base was placed on the undisturbed pavement, a minimum of 5 in. of Class 5 aggregate was placed. Both sub-base and base aggregates were generally carefully selected to obtain high bearing materials. When binder soil was added to the aggregate, care was exercised to incorporate only amounts sufficient to correct the gradation and facilitate consolidation.

It is not expected that spring load restrictions will be applied on these projects.

4. A fourth group consisted of base construction in conjunction with grading. Examples of this group are State Projects 6007-02, 6409-02 and 6913-12. This consisted of constructing 6 or 9 in. of sub-base under the provisions of 2201 followed by 3 in. of base under the provisions of 2202. Where grading resulted in a granular subgrade, only three inches of gravel base was constructed.

Upper Lift as Sub-base

On a number of projects, which are not tabulated, the upper 12 in. of the grade was constructed with granular Class C material in conjunction with the grading. Class C material is a

designation in the grading specifications covering soil materials (including sand or gravelly materials) moved in regular grading construction and encountered within the limits of the highway or in borrow pits. Although there were no gradation provisions for the materials and they were placed as embankment under the provisions of 2110, this upper 12 in. will serve as a sub-base. Gravel or salvage surfacing was placed in conjunction with the grading.

On State Projects 3301-04 and 8303-02, sand and gravel sub-base was constructed in conjunction with concrete paving to provide a base for the pavement.

On all of the projects tabulated, it was provided that the sub-base and base be constructed in layers not to exceed 3 in. compacted thickness. Generally, compaction was controlled by the "Method of Specified Density" for bases constructed under the provision of 2202. The "Method of Ordinary Compaction" was used for most of the sub-base construction.

Crushing was required for most of the Class 5 base material, but only screening was required for the Class 4 sub-base material with the exception of a few projects, where crushing was required, and three projects where only loading was required.

In common with previous years, recovery of load supporting capacity of the roadway on many projects was slow in the spring of 1951. As the construction season progressed, excessive wet weather developed, causing the subgrade to return to a weak condition on some projects. As the wet weather continued into the fall there was a general loss of load supporting capacity in most areas.

(See following three pages for tables accompanying this article, which continues on page 42.)

Data on Base Construction, Minnesota 1951 State Highway Projects

| Project No. | T.H. No. | Location | Length | Type of Base | Base Spec. | 3138 Class Cr (Crushed) Ser (Screened) | Method of Stabilization | Binder Source | Aggregate Source Pit No. | Thickness of Base |
|---|----------------------|--|--------|--------------|------------|--|--------------------------------------|-----------------|--------------------------|--------------------------|
| 0112-21 3110-05 | 65 | 1.0 Mi. S. of Lily to Jet. T.H. No. 2 | 24.5 | Base | 2202 | 5M/Cr. | Separate Conveyor | Overburden | 3324 1355 | 3"-12" 3"-9" |
| 0301-04 0302-12 0305-02 0305-30 | 10 19 59 34 | Detroit Lakes to 11 Mi. E. | 12.0 | Base | 2202 | 5M/Cr. | | | 2261 | 6"-9" |
| 0507-03 | 218 | Gilman to W. Jet. T.H. 95 | 10.7 | Base | 2202 | 5M/Cr. | Separate Conveyor | Overburden | 2454 | 6"-9" |
| 0508-04 | | | | | | | | Pit No. 28 | 3476 | 3"-12" |
| 0604-10 0604-11 0605-07 0605-08 7804-09 | 28 | Browns Valley to Graceville | 29.7 | Base | 2202 | 5M/Cr. | | | 3335 | 6" |
| 1109-07 | 64 | Jet. T.H. 210 to Leader | 14.0 | Base | 2202 | 5M/Cr. | Separate Conveyor | Overburden | 910 3342 | 3"-9" |
| 1403-13 | 32 | Jet. T.H. No. 10 to Elen | 14.5 | Subbase | 2201 | 4M/Ser. | | | 1576 3318 | 9" " |
| | | | | Base | 2202 | 5M/Cr. | Separate Conveyor | Pit A | 1911B 3318 | 3" " |
| 1809-12 1807-02 | 210 | Ironton to Deerwood | 4.8 | Base | 2202 | 5M/Cr. | Separate Conveyor | Overburden | 613A | 6"-12" |
| 1914-03 | 65 | In Lakeville between N. Corporate Limits and S. Corporate Limits | 0.5 | Base | 2202 | 5M/Cr. | | | 2678 | 10"+ |
| 1916-09 | 88 | Rosemount to South Jet. T.H. 55 | 8.2 | Subbase | 2201 | 4M/Ser. | | | 3487 3502 | 12"-24" |
| | | | | Base | 2202 | 5M/Cr. | Separate Conveyor (Very little used) | Overburden | 3487 | 5"-9" |
| 1921-21 | 218 | | | | | | | | 3346 | 6"-9" |
| 2604-03 | 27 | Jet. of T.H. 9 in Herman to 8.3 Mi. E. | 8.3 | Subbase | 2201 | 4M/Ser. | Separate Conveyor | Overburden | 48 | 3" |
| | | | | Base | 2202 | 5M/Cr. | | | 796 | 12"-18" |
| 2706-14** | 7 | Excelsior to W. Limits of Myle | 12.2 | Base | 2202 | 5M/Cr. | Separate Conveyor | Overburden | 2939 3531 | " " |
| 3101-06*** | 1 | 1 Mi. W. of Effie to 6.3 Mi. E. of Jet. T.H. 38 in Effie | 7.2 | Subbase | 2201 | 4M/Ser. | Separate Conveyor | Overburden | 2831 2884 | 9" " |
| 3301-04 4807-01 | 23 | Jet. T.H. 109 in Milaca to Ogilvie | 12.7 | Subbase | 2201 | 4M/Ser. | | | 3259 3664 | 12" " |
| | | | | | | | | | 2808 | " |
| 3415-05 | 104 | Sunburg to Jet. T.H. 12 | 13.1 | Base | 2202 | 5M/Cr. | | | 3368 | 6" |
| 3604-25 | 11 | Clementon to Frontier | 10.7 | Subbase | 2201 | 4M/Load | | | 1888 | 7"-10" |
| | | | | | | 4M/Cr. | | | 99C | 7"-13" |
| 3802-07 | | | | Base | 2202 | 5M/Cr. | | | 99C | 2" |
| 4103-05*** | 19 | W. State Line to Jet. T.H. 75 in Ivandoe | 10.4 | Base | 2202 | 5M/Cr. | | | 2196 | 6"-9" |
| 4107-07 5006-14 | 73 | Pipestone to Lake Benton | 17.6 | Base | 2202 | 5M/Cr. | | | 3258 1794 3276 | 6"-12" 6"-9" 6"-9" |
| 6007-02*** | 32 | Jet. T.H. 2 at Maroon Corners to T.H. 102 | 14.7 | Base | 2202 | 5M/Cr. | Separate Conveyor | Overburden | 3686 213 | 3" 3" |
| 6010-08 | 75 | Jet. T.H. 2.1 mi. E. of Crookston to Beltrami | 15.8 | Base | 2202 | 5M/Cr. | Separate Conveyor | 223A | 3687 | 3"-6" |
| 6006-07 | 93 | Jet. T.H. 71 in Redwood Falls to Morgan | 12.9 | Subbase | 2201 | 4M/Ser. | Separate Conveyor | Overburden | 1138 | 6"-7" |
| | | | | | | | | | 1993A 1993B 1993B | " " 3" |
| 6409-02*** | 273 | Jet. T.H. 19 to N. Jet. State Aid Road No. 9 in Belview | 5.0 | Subbase | 2201 | 4M/Ser. | | | 3573 | 6" |
| 6913-12 | 35 | 2.5 mi. N. of Aurora to 2.7 mi. W. of Embarras | 0.9 | Base | 2202 | 5M/Cr. | Separate Conveyor | Rt. of Sta. 370 | 363 * | 3" |
| 7409-04*** | 65 | Steele Center to Owatonna | 6.0 | Subbase | 2201 | 4M/Ser. | | | 3533 | 6"-9" |
| | | | | Base | 2202 | 5M/Cr. | | | 3533 | 6" |
| 8210-21 8211-09 | 95 | Stillwater to 4 Mi. W. | 4.6 | Base | 2202 | 5M/Cr. | Separate Conveyor | Pit A | 3640 | 4"-12" |
| 8303-02 8304-07 8309-07 | 15 99 | St. James to Medford | 12.4 | Subbase | 2201 | 4M/Ser. | | | 1862 3582 | 12" 12" |

Notes: *Average Weighted according to the number of times each curve was used.
**Partially constructed in 1950. Summary contains portion constructed in 1951.

***Partially constructed in 1951. To be completed in 1952.
1 No. 100 Sieve and 100/40 Ratio For Crushed Rock.

This Table Continues from Page 40 and Across Next Page

| No. Tests | Average Per Cent Passing | | | | | % Passing #10 | | | Laboratory Graduation Results % Passing #40 | | | | | | % Passing #200 | | | Ratio #10/40 | | | Ratio #40/200 | | | P.I. | Project No. |
|-----------|--------------------------|------|--------|------|------|---------------|-------|-------|--|-------|-------|------|-------|-------|----------------|-------|-------|--------------|-------|-------|---------------|-----|-------|---|-------------|
| | 3" | 2" | 1 1/2" | 1" | 3/4" | #4 | Min. | Max. | Avg. | Min. | Max. | Avg. | Min. | Max. | Avg. | Min. | Max. | Avg. | Min. | Max. | Avg. | No. | Range | | |
| 21 | 100 | 100 | 100 | 94.8 | 76.8 | 64.9 | 39.1 | 62.6 | 51.3 | 7.6 | 30.3 | 14.6 | 2.0 | 6.5 | 4.0 | .19 | .49 | .28 | .12 | .40 | .27 | 21 | S.P. | 0112-21 | |
| 14 | 100 | 100 | 100 | 92.1 | 69.9 | 60.1 | 43.1 | 59.7 | 52.1 | 11.2 | 42.8 | 33.6 | 1.8 | 5.8 | 4.7 | .19 | .78 | .64 | .10 | .20 | .14 | 9 | S.P. | 3110-05 | |
| 7 | 100 | 100 | 100 | 95.6 | 81.0 | 71.2 | 55.7 | 69.9 | 60.5 | 16.4 | 30.0 | 23.7 | 5.0 | 6.9 | 5.5 | .26 | .45 | .39 | .19 | .30 | .21 | 7 | S.P. | 0301-04 0301-12 0305-02 0303-30 | |
| 13 | 100 | 100 | 100 | 96.1 | 75.5 | 62.3 | 41.1 | 59.6 | 49.9 | 12.3 | 32.6 | 22.2 | 2.5 | 5.5 | 4.6 | .24 | .39 | .45 | .12 | .29 | .18 | 1 | N.P. | 0507-03 | |
| 15 | 100 | 100 | 100 | 91.6 | 68.7 | 53.2 | 32.6 | 48.1 | 40.7 | 16.4 | 22.3 | 19.6 | 3.7 | 6.6 | 4.7 | .44 | .55 | .48 | .19 | .35 | .24 | 2 | N.P. | 0508-01 | |
| 30 | 100 | 100 | 100 | 96.0 | 81.5 | 65.8 | 43.0 | 57.4 | 50.5 | 14.0 | 25.0 | 19.5 | 6.1 | 10.9 | 8.2 | .32 | .43 | .38 | .35 | .51 | .43 | 20 | S.P. | 0304-10 0304-11 0305-07 0305-08 7801-03 | |
| 15 | 100 | 100 | 100 | 98.0 | 90.3 | 81.6 | 66.3 | 76.0 | 71.1 | 29.3 | 35.2 | 31.5 | 4.5 | 7.1 | 5.9 | .42 | .49 | .44 | .15 | .21 | .19 | 15 | S.P. | 1109-07 | |
| 7 | 100 | 100 | 100 | 96.8 | 82.8 | 73.3 | 57.5 | 70.6 | 63.2 | 15.7 | 31.7 | 25.4 | 4.4 | 8.4 | 5.6 | .24 | .48 | .40 | .15 | .30 | .22 | 1 | N.P. | | |
| 12 | 100 | 99.6 | 93.2 | 89.7 | 81.3 | 73.0 | 53.9 | 68.2 | 62.3 | 28.2 | 36.4 | 33.3 | 3.9 | 7.3 | 5.4 | .51 | .55 | .54 | .11 | .21 | .18 | 12 | S.P. | 1801-13 | |
| 10 | 100 | 100 | 100 | 94.7 | 90.0 | 77.5 | 65.7 | 48.6 | 57.3 | 9.8 | 30.1 | 24.3 | 3.3 | 7.1 | 5.8 | .20 | .58 | .46 | .20 | .34 | .25 | 8 | S.P. | | |
| 11 | 100 | 100 | 100 | 96.6 | 84.0 | 70.1 | 47.8 | 58.3 | 52.5 | 18.5 | 30.1 | 21.8 | 4.6 | 7.0 | 5.4 | .35 | .52 | .41 | .17 | .31 | .25 | 11 | S.P. | | |
| 6 | 100 | 100 | 100 | 96.0 | 79.9 | 66.2 | 39.1 | 61.4 | 51.5 | 15.8 | 26.3 | 21.6 | 5.9 | 6.7 | 5.0 | .37 | .46 | .42 | .17 | .33 | .24 | 6 | S.P. | | |
| 5 | 100 | 100 | 100 | 95.8 | 81.8 | 72.9 | 61.8 | 63.9 | 62.4 | 22.1 | 23.8 | 23.2 | 3.8 | 4.9 | 4.3 | .37 | .38 | .37 | .18 | .21 | .19 | 2 | N.P. | 1806-12 1807-02 | |
| 13 | 100 | 100 | 100 | 96.9 | 80.2 | 68.7 | 50.9 | 65.2 | 60.0 | 23.9 | 33.9 | 29.7 | 2.6 | 4.8 | 3.7 | .45 | .55 | .49 | .09 | .15 | .13 | 13 | S.P. | 1914-03 | |
| 17 | 100 | 97.7 | 89.4 | 84.8 | 75.9 | 67.5 | 50.4 | 74.8 | 59.9 | 25.1 | 38.0 | 30.9 | 1.7 | 4.5 | 2.6 | .47 | .61 | .51 | .05 | .15 | .09 | 15 | N.P. | 1916-09 | |
| 6 | 100 | 100 | 93.2 | 88.7 | 80.0 | 70.2 | 59.4 | 61.8 | 60.5 | 23.7 | 31.6 | 28.8 | 2.0 | 4.3 | 3.1 | .40 | .51 | .47 | .08 | .14 | .11 | 6 | N.P. | 1921-21 | |
| 46 | 100 | 100 | 100 | 92.7 | 74.7 | 62.0 | 41.3 | 61.0 | 51.4 | 18.8 | 29.2 | 24.3 | 2.4 | 5.5 | 3.5 | .42 | .52 | .47 | .08 | .19 | .14 | 18 | S.P. | | |
| 15 | 100 | 100 | 98.9 | 97.4 | 92.2 | 85.4 | 66.6 | 83.5 | 77.4 | 28.6 | 49.2 | 38.7 | 4.9 | 9.4 | 6.7 | .42 | .59 | .50 | .12 | .25 | .17 | 14 | S.P. | 2904-03 | |
| 15 | 100 | 100 | 100 | 98.6 | 89.7 | 79.6 | 64.4 | 71.5 | 67.0 | 19.3 | 29.2 | 24.4 | 4.1 | 8.7 | 6.6 | .29 | .44 | .37 | .19 | .35 | .27 | 15 | S.P. | | |
| 7 | 100 | 100 | 100 | 95.4 | 81.7 | 69.8 | 51.9 | 63.3 | 58.4 | 13.8 | 22.7 | 17.6 | 2.2 | 3.9 | 2.7 | .28 | .36 | .33 | .12 | .20 | .16 | 7 | S.P. | 2706-14** | |
| 5 | 100 | 100 | 100 | 95.7 | 82.5 | 68.1 | 48.6 | 59.5 | 54.7 | 16.3 | 21.2 | 17.3 | 3.5 | 7.3 | 4.2 | .25 | .41 | .32 | .28 | .34 | .31 | 5 | S.P. | | |
| 6 | 100 | 100 | 100 | 100 | 85.5 | 69.6 | 61.2 | 56.9 | 54.8 | 18.7 | 21.1 | 19.9 | 4.2 | 5.3 | 4.7 | .34 | .38 | .36 | .22 | .26 | .24 | 4 | N.P. | | |
| 12 | 100 | 100 | 98.1 | 96.9 | 93.1 | 87.1 | 63.2 | 88.3 | 77.7 | 15.2 | 40.6 | 30.4 | 2.8 | 9.4 | 5.6 | .22 | .51 | .39 | .08 | .29 | .18 | 1 | N.P. | 3101-00*** | |
| 1 | 100 | 100 | 93.6 | 86.8 | 77.3 | 67.7 | ..... | ..... | 50.7 | ..... | ..... | 13.0 | ..... | ..... | 4.1 | ..... | ..... | .26 | ..... | ..... | .31 | 11 | S.P. | | |
| 2 | 100 | 100 | 96.5 | 93.3 | 85.6 | 80.8 | 68.7 | 80.5 | 74.6 | 43.5 | 50.9 | 47.2 | 13.2 | 13.5 | 13.4 | .63 | .63 | .63 | .26 | .30 | .28 | 2 | S.P. | 3301-04 | |
| 15 | 100 | 98.1 | 88.1 | 80.0 | 65.5 | 54.6 | 31.9 | 58.3 | 43.0 | 11.2 | 23.0 | 15.9 | 3.8 | 11.6 | 5.6 | .27 | .49 | .37 | .23 | .52 | .35 | 10 | S.P. | 4902-03 | |
| 18 | 100 | 99.6 | 90.7 | 85.0 | 73.2 | 65.1 | 40.3 | 76.4 | 54.6 | 16.0 | 42.4 | 25.3 | 2.9 | 12.0 | 6.0 | .37 | .57 | .46 | .11 | .34 | .23 | 2 | S.P. | 18-6.0 | |
| 29 | 100 | 100 | 100 | 95.9 | 82.8 | 70.4 | 46.0 | 64.6 | 56.9 | 15.1 | 23.5 | 18.6 | 2.1 | 6.6 | 4.6 | .26 | .42 | .33 | .13 | .32 | .25 | 29 | S.P. | 3415-05 | |
| 34 | 100 | 100 | 99.8 | 98.8 | 87.9 | 72.3 | 34.1 | 73.1 | 53.7 | 12.5 | 36.0 | 21.6 | 1.7 | 6.5 | 4.1 | .26 | .50 | .39 | .09 | .27 | .20 | 34 | S.P. | 3604-25 | |
| 6 | 100 | 100 | 98.3 | 96.6 | 92.4 | 79.3 | 57.7 | 83.0 | 65.7 | 23.2 | 43.4 | 32.3 | 5.5 | 13.5 | 8.5 | .37 | .55 | .49 | .17 | .40 | .26 | 2 | N.P. | 3902-07 | |
| 12 | 100 | 100 | 100 | 92.4 | 71.0 | 57.6 | 28.3 | 54.6 | 45.7 | 6.6 | 31.7 | 21.7 | 2.4 | 7.2 | 4.5 | .19 | .58 | .46 | .15 | .36 | .23 | 8 | N.P. | 31-7.1 | |
| 17 | 100 | 100 | 100 | 96.0 | 83.7 | 73.1 | 55.6 | 71.8 | 62.3 | 23.5 | 33.3 | 30.0 | 4.4 | 7.8 | 6.1 | .41 | .54 | .42 | .17 | .26 | .20 | 17 | S.P. | 4103-05*** | |
| 20 | 100 | 100 | 100 | 97.5 | 81.8 | 66.9 | 41.6 | 59.4 | 52.1 | 13.6 | 25.1 | 19.2 | 4.1 | 7.6 | 5.9 | .32 | .42 | .37 | .22 | .40 | .31 | 20 | S.P. | 4107-07 | |
| 14 | 100 | 100 | 100 | 94.0 | 80.0 | 67.0 | 33.2 | 65.0 | 56.2 | 20.6 | 33.2 | 25.2 | 4.6 | 8.4 | 5.8 | .38 | .51 | .45 | .19 | .32 | .23 | 14 | S.P. | 5006-14 | |
| 25 | 100 | 100 | 100 | 96.2 | 78.9 | 63.5 | 40.5 | 56.0 | 50.6 | 11.4 | 23.8 | 18.9 | 3.5 | 9.4 | 5.7 | .28 | .50 | .38 | .24 | .39 | .30 | 25 | S.P. | | |
| 4 | 100 | 100 | 100 | 100 | 79.4 | 65.7 | 48.9 | 60.1 | 55.2 | 17.0 | 23.2 | 19.5 | 3.8 | 5.5 | 4.8 | .33 | .38 | .36 | .22 | .26 | .24 | 4 | S.P. | 6007-02*** | |
| 1 | 100 | 100 | 100 | 100 | 89.1 | 70.5 | ..... | ..... | 52.8 | ..... | ..... | 21.0 | ..... | ..... | 2.3 | ..... | .40 | ..... | ..... | ..... | .11 | 1 | S.P. | | |
| 33 | 100 | 100 | 100 | 97.3 | 80.5 | 67.7 | 42.0 | 66.4 | 50.5 | 15.1 | 44.9 | 23.4 | 3.9 | 7.6 | 5.3 | .07 | .66 | .43 | .10 | .40 | .24 | 33 | S.P. | 6010-08 | |
| 11 | 100 | 100 | 94.5 | 89.6 | 79.5 | 69.8 | 51.8 | 71.3 | 61.0 | 19.6 | 38.1 | 26.4 | 2.8 | 5.8 | 4.5 | .36 | .53 | .43 | .10 | .26 | .18 | 2 | N.P. | 6406-07 | |
| 5 | 100 | 100 | 96.1 | 91.1 | 77.3 | 60.3 | 38.2 | 52.0 | 45.2 | 14.8 | 21.3 | 18.1 | 3.7 | 5.9 | 4.8 | .37 | .44 | .40 | .23 | .31 | .27 | 5 | S.P. | | |
| 10 | 100 | 100 | 97.2 | 92.7 | 79.2 | 63.7 | 41.2 | 64.0 | 51.1 | 17.3 | 26.4 | 23.8 | 2.4 | 5.7 | 4.1 | .35 | .52 | .47 | .11 | .33 | .18 | 10 | S.P. | | |
| 13 | 100 | 100 | 100 | 96.1 | 79.7 | 63.2 | 42.8 | 61.5 | 49.0 | 13.9 | 26.2 | 20.6 | 3.1 | 5.2 | 4.3 | .30 | .47 | .42 | .17 | .29 | .21 | 12 | S.P. | | |
| 1 | 100 | 100 | 99.3 | 97.6 | 93.9 | 88.5 | ..... | ..... | 81.1 | ..... | ..... | 20.8 | ..... | ..... | 2.7 | ..... | ..... | .26 | ..... | ..... | .13 | 1 | S.P. | 6409-02*** | |
| 11 | 100 | 100 | 100 | 99.9 | 83.6 | 70.9 | 52.9 | 64.0 | 59.6 | 20.5 | 31.9 | 25.2 | 5.7 | 9.8 | 7.4 | .31 | .51 | .42 | .25 | .34 | .30 | 4 | N.P. | 6913-12 | |
| 16 | 100 | 100 | 100 | 98.3 | 94.6 | 84.8 | 77.4 | 55.1 | 80.3 | 66.7 | 13.1 | 39.9 | 21.5 | 1.4 | 4.9 | 3.7 | .20 | .50 | .32 | .11 | .29 | .18 | 2 | N.P. | 7406-04*** |
| 23 | 100 | 100 | 100 | 95.9 | 84.0 | 73.9 | 50.3 | 70.9 | 62.4 | 13.1 | 23.9 | 17.3 | 1.4 | 7.0 | 3.5 | .20 | .42 | .28 | .11 | .33 | .20 | 23 | S.P. | | |
| 32 | 100 | 100 | 100 | 91.8 | 78.8 | 70.0 | 51.2 | 69.5 | 59.1 | 21.7 | 32.8 | 26.7 | 3.3 | 9.2 | 7.0 | .38 | .58 | .45 | .12 | .34 | .25 | 2 | N.P. | 8210-21 | |
| | | | | | | | | | | | | | | | | | | | | | | 20 | S.P. | 8211-06 | |
| 7 | 100 | 100 | 98.7 | 97.0 | 91.4 | 87.0 | 61.2 | 98.4 | 76.2 | 19.5 | 81.4 | 46.1 | 3.1 | 8.2 | 4.9 | .32 | .83 | .56 | .04 | .17 | .12 | 1 | N.P. | 8303-02 | |
| 27 | 100 | 100 | 98.9 | 97.1 | 92.3 | 85.7 | 61.1 | 83.3 | 77.2 | 21.7 | 50.0 | 37.6 | 1.4 | 8.3 | 5.1 | .36 | .65 | .49 | .04 | .25 | .13 | 7 | S.P. | 8304-02 | |
| | | | | | | | | | | | | | | | | | | | | | | 20 | N.P. | 8309-07 | |

Continuing Table of Project Data from Two Previous Pages

| Project No. | No. | Field | | | No. | Descriptive | | | No. | Relative | | | Moisture | | | Optimum | Avg. | Rel. Avg. | Modification of Spec. 3158 Addition to Standard Mod- ification (% passing) |
|-------------|-----|-------|-------|-------|-----|-------------|-------|-------|-------|----------|-------|------|----------|------|------|---------|------|-----------|--|
| | | Min. | Max. | Avg. | | Min. | Max. | Avg. | | Min. | Max. | Avg. | Min. | Max. | Avg. | | | | |
| 0112-21 | 25 | 123.2 | 152.7 | 138.2 | 11 | 123.6 | 159.5 | 135.5 | 96.7 | 109.5 | 101.9 | 2.2 | 8.0 | 4.5 | 8.5 | 13.6 | 10.9 | 41.3 | |
| 0110-03 | 24 | 130.1 | 156.6 | 143.0 | 3 | 131.7 | 138.3 | 135.4 | 98.0 | 119.0 | 105.3 | 2.5 | 6.2 | 4.3 | 8.7 | 11.1 | 9.3 | 46.2 | |
| 0301-04 | 28 | 117.1 | 141.2 | 131.3 | 6 | 124.8 | 136.0 | 131.9 | 91.3 | 109.8 | 99.5 | 2.5 | 7.6 | 5.3 | 6.3 | 11.8 | 9.7 | 54.6 | |
| 0302-12 | | | | | | | | | | | | | | | | | | | |
| 0303-02 | | | | | | | | | | | | | | | | | | | |
| 0304-20 | | | | | | | | | | | | | | | | | | | |
| 0507-03 | 24 | 132.3 | 155.3 | 142.0 | 8 | 132.5 | 149.6 | 136.4 | 96.0 | 111.7 | 104.5 | 2.3 | 5.6 | 4.2 | 6.4 | 8.1 | 7.4 | 56.0 | |
| 0508-04 | 32 | 131.5 | 136.4 | 140.1 | 8 | 131.5 | 143.3 | 139.6 | 95.3 | 109.1 | 100.4 | 1.9 | 4.5 | 3.3 | 4.5 | 7.9 | 7.1 | 46.9 | |
| 0904-10 | 64 | 106.6 | 135.2 | 123.7 | 17 | 112.3 | 125.0 | 121.2 | 87.0 | 111.5 | 102.1 | 3.7 | 12.4 | 8.3 | 10.0 | 15.9 | 12.9 | 64.1 | |
| 0904-11 | | | | | | | | | | | | | | | | | | | |
| 0905-07 | | | | | | | | | | | | | | | | | | | |
| 0905-08 | | | | | | | | | | | | | | | | | | | |
| 7804-09 | | | | | | | | | | | | | | | | | | | |
| 1109-07 | 40 | 126.7 | 155.0 | 136.2 | 10 | 125.9 | 130.1 | 128.3 | 98.0 | 120.4 | 109.7 | 3.4 | 8.0 | 5.6 | 6.2 | 10.4 | 8.2 | 69.6 | #4 50-85, #10 35-75, #10 8-40 |
| | 19 | 130.2 | 146.3 | 135.6 | 5 | 126.6 | 135.6 | 131.6 | 97.4 | 111.0 | 103.3 | 2.1 | 7.0 | 5.3 | 7.2 | 10.6 | 8.5 | 61.6 | |
| 1403-11 | | | | | | | | | | | | | | | | | | | |
| | 16 | 131.5 | 143.5 | 137.5 | 4 | 128.7 | 130.7 | 130.0 | 100.6 | 111.5 | 105.9 | 3.8 | 7.7 | 5.9 | 9.1 | 10.4 | 9.7 | 60.6 | |
| | 13 | 131.3 | 145.9 | 137.9 | 4 | 129.2 | 131.7 | 130.5 | 99.8 | 111.0 | 105.3 | 3.1 | 8.5 | 5.9 | 9.6 | 11.3 | 10.4 | 56.3 | |
| 1406-12 | 4 | 133.8 | 146.4 | 140.8 | 2 | 127.8 | 127.8 | 127.8 | 104.6 | 113.9 | 109.9 | 3.4 | 6.0 | 4.9 | 4.9 | 9.4 | 8.3 | 60.4 | |
| 1407-02 | | | | | | | | | | | | | | | | | | | |
| 1514-03 | 9 | 128.0 | 138.8 | 133.4 | 4 | 128.5 | 132.2 | 130.0 | 98.8 | 105.4 | 102.6 | 3.9 | 5.8 | 4.8 | 7.1 | 9.3 | 8.4 | 58.1 | |
| 1516-09 | 3 | 155.0 | 142.3 | 138.7 | 1 | | 135.5 | 100.0 | 104.7 | 102.4 | 4.2 | 7.8 | 5.6 | | | 9.9 | 56.3 | | |
| 1923-21 | 52 | 130.9 | 145.9 | 138.1 | 2 | 134.4 | 135.5 | 135.4 | 96.5 | 107.0 | 102.0 | 1.5 | 8.0 | 4.3 | 8.2 | 10.0 | 9.8 | 43.8 | |
| 2004-01 | 12 | 126.0 | 139.1 | 134.5 | 2 | 124.1 | 125.1 | 124.2 | 101.5 | 112.1 | 108.5 | 4.9 | 8.2 | 6.3 | 7.9 | 12.5 | 12.2 | 52.1 | 1" 100, 1/2" 90-100, 1/4" 65-95, #4 50-85, #10 35-70, #40 8-35, #200 2-10 |
| 2109-14** | 17 | 122.7 | 141.9 | 134.1 | 3 | 130.6 | 132.5 | 131.5 | 93.2 | 107.7 | 102.0 | 3.4 | 4.9 | 4.3 | 9.2 | 11.0 | 10.2 | 42.5 | |
| | 11 | 125.7 | 143.9 | 134.4 | 2 | 130.4 | 130.6 | 130.5 | 96.2 | 111.7 | 102.9 | 3.7 | 6.3 | 5.0 | 9.2 | 10.0 | 9.3 | 54.3 | |
| | 7 | 129.8 | 140.0 | 133.3 | 2 | | 134.5 | 96.5 | 104.1 | 99.1 | 2.0 | 4.3 | 3.6 | 7.5 | 8.3 | 7.9 | 45.6 | | |
| 3101-00*** | 28 | 123.7 | 147.9 | 133.8 | 10 | 119.0 | 132.2 | 122.5 | 101.6 | 120.6 | 109.2 | 3.0 | 9.8 | 6.9 | 7.6 | 11.7 | 9.0 | 78.0 | |
| 3301-04 | | | | | | | | | | | | | | | | | | | In upper 3" max. size=1" diris |
| 4802-03 | | | | | | | | | | | | | | | | | | | diris |
| | 14 | 127.8 | 142.8 | 133.8 | 2 | 132.5 | 133.9 | 132.6 | 96.5 | 107.8 | 101.0 | 2.4 | 6.6 | 5.1 | 4.7 | 5.9 | 5.8 | 87.4 | |
| 0415-03 | 35 | 105.1 | 156.0 | 135.1 | 27 | 119.3 | 130.8 | 126.1 | 88.0 | 124.0 | 107.2 | 4.2 | 9.4 | 6.9 | 8.5 | 13.1 | 11.1 | 62.4 | |
| 0604-25 | | | | | | | | | | | | | | | | | | | 2" 100 |
| 0802-07 | 20 | 126.0 | 162.4 | 146.6 | 20 | 129.7 | 141.6 | 135.5 | 96.2 | 123.9 | 108.4 | 2.4 | 10.7 | 5.4 | 7.4 | 9.3 | 7.9 | 68.3 | |
| 1101-05*** | 29 | 124.2 | 148.9 | 138.3 | 29 | 122.6 | 133.9 | 128.7 | 99.4 | 114.5 | 107.2 | 4.2 | 8.2 | 6.4 | 7.6 | 12.4 | 10.2 | 62.7 | #40 8-40, #10 35-70 |
| 1107-07 | 41 | 128.4 | 156.0 | 140.2 | 41 | 127.6 | 135.0 | 131.2 | 97.3 | 118.0 | 106.8 | 3.2 | 8.5 | 6.5 | 9.0 | 11.7 | 10.2 | 63.8 | |
| 1406-14 | 35 | 127.1 | 154.0 | 137.7 | 35 | 119.6 | 139.1 | 125.8 | 100.5 | 122.4 | 109.5 | 4.0 | 8.1 | 6.5 | 10.1 | 14.0 | 11.6 | 56.3 | |
| | 36 | 126.9 | 145.5 | 137.9 | 36 | 126.5 | 134.0 | 130.3 | 99.0 | 111.4 | 106.0 | 3.2 | 8.3 | 5.9 | 9.0 | 11.6 | 10.1 | 57.9 | |
| 0807-02*** | | | | | | | | | | | | | | | | | | | #10 75 |
| 0010-08 | 42 | 133.8 | 158.6 | 148.2 | 4 | 132.0 | 135.5 | 134.0 | 101.4 | 120.1 | 110.9 | 2.2 | 7.3 | 4.9 | 6.8 | 8.3 | 7.8 | 63.4 | |
| 0406-07 | | | | | | | | | | | | | | | | | | | |
| | 1 | 125.0 | 133.7 | 129.9 | 1 | | 132.0 | 94.7 | 101.0 | 98.1 | 3.3 | 5.1 | 4.4 | | | 11.0 | 40.3 | | |
| | 24 | 124.0 | 158.4 | 136.7 | 1 | | 128.0 | 97.0 | 123.6 | 102.8 | 3.1 | 9.2 | 6.7 | | | 11.4 | 38.5 | | |
| 0409-02*** | | | | | | | | | | | | | | | | | | | |
| 0913-12 | 17 | 129.9 | 147.3 | 134.1 | 3 | 125.0 | 133.6 | 132.1 | 97.3 | 116.0 | 107.1 | 2.2 | 6.4 | 4.6 | 6.4 | 9.2 | 8.8 | 52.0 | |
| 7405-04*** | 24 | 114.8 | 162.3 | 127.2 | 6 | 121.1 | 125.0 | 123.9 | 92.2 | 130.3 | 102.9 | 5.7 | 10.4 | 8.0 | 10.4 | 13.5 | 11.5 | 70.7 | |
| | 24 | 104.9 | 139.6 | 122.3 | 4 | 120.9 | 124.5 | 122.2 | 86.6 | 115.2 | 105.0 | 6.1 | 9.3 | 7.3 | 11.1 | 13.5 | 12.4 | 58.2 | |
| 8210-21 | 27 | 129.0 | 143.0 | 135.9 | 13 | 131.6 | 139.1 | 136.0 | 93.0 | 111.2 | 101.9 | 3.2 | 7.4 | 5.3 | 7.1 | 9.0 | 8.3 | 62.8 | |
| 8211-06 | 18 | 136.9 | 149.5 | 142.3 | 4 | 134.1 | 137.8 | 136.1 | 99.2 | 107.2 | 101.4 | 3.5 | 7.5 | 5.6 | 7.1 | 8.3 | 7.9 | 67.3 | |
| 8308-02 | | | | | | | | | | | | | | | | | | | |
| 8304-02 | 16 | 117.2 | 142.5 | 129.1 | 2 | 114.0 | 120.3 | 118.3 | 96.0 | 112.0 | 103.5 | 9.8 | 14.0 | 11.3 | 12.5 | 13.0 | 12.7 | 89.8 | #40 0-50, #200 0-15 |
| 8309-07 | | | | | | | | | | | | | | | | | | | |

(Continued from page 39)

As a result, it was difficult on many projects to develop sufficient subgrade firmness to withstand deterioration from base aggregate hauling. Blade aeration and consolidation with a tamping roller or spot reinforcement was successful in developing firmness on some projects; but on others, continued wet weather prevented sufficient drying to obtain firmness. Where localized areas persisted in remaining soft, the only solution was removal of the soft material and replacement with gravel, which was done successfully on many projects. On a few projects the subgrade weakness from excess moisture was so general that it was not possible to develop a firm subgrade.

On a number of projects, extensive subgrade rutting developed through the first few layers of base as a result of aggregate hauling. Much of this was because of faulty sequence in the base construction aggravated by wet weather. But, in a few instances, the subgrade was so moist that it was extremely difficult to place the first few layers without the occurrence of rutting. The most common fault in the sequence of construction was the placing of an excessive length of the first layer which absorbed moisture and rutted when exposed to the weather, traffic and hauling for too long a period before succeeding layers were placed.

Correction of the rutted condition consisted of blading out the rutted sections, permitting the subgrade to aerate and then relaying the base. In many cases, an added base layer was placed for reinforcement.

It was found that early assessment of the condition of the existing roadway, and institution of proper reworking, consolidation, shaping and reinforcing previous to hauling gave the best results. This tended to reduce the hauling damage to the existing roadway and first layers of base.

Graduation Requirement Including Standard Modification (% Passing) Under Minnesota Spec. 3138

| (Sieve) | Cl. 3 (Cr. Rock Base) | Cl. 4 (Sub-base) | Cl. 5 (Base) |
|------------------|--------------------------|---------------------|-----------------|
| 3" | | 100 | 100 |
| 1" | 100 | | 90-100 |
| 3/4" | 65-90 | | 65-95 |
| 1/2" | 35-70 | 55-100 | 50-80 |
| 3/8" | 25-45 | 35-100 | 35-65 |
| #10 | | 5-50 | 8-35 |
| #20 | 10-20 | | |
| #40 | | 0-10 | 3-10 |
| #100 | | 0-6 | 0-6 |
| #200 | | | |
| Plasticity Index | 0-8 | | |

For Classes 3 and 4 the fraction passing the No. 200 sieve shall not be more than 40% of the fraction passing the No. 40 sieve.

Although considerable effort was expended for roadbed preparation and the correction of unsuccessful base placements, it is probable that some sub-standard base structures were obtained because of the extremely unfavorable weather during the 1951 construction season.

Stabilization Methods

The method of stabilization is indicated in the tabulation.

On many of the projects, the aggregate sources contained material that did not require the addition of binder soil.

It was required on all projects that the aggregate pits were to be stripped clean.

When the addition of binder soil was considered necessary, it was introduced into the crushing or screening plant by a separate conveyor simultaneously with the sand or gravel. The contract for the construction on many of the projects contained provisions for adding binder in this manner, but it was not necessary to apply the provisions in all cases. Quite often, increased refinement was applied in blending and loading in order to produce aggregate that would conform to the specifications without the addition of binder. When binder was added, the proportions were varied as changes occurred in the fines content of the aggregate, and only enough was added to produce consolidation with considerable care being exercised to avoid an

excess.

The binder on most projects was obtained from the aggregate pit overburden but on a few of the projects a separate binder pit was used. It was required that the binder be pulverized to the extent that all of it would pass a 3/4 in. screen.

Proportioning was accomplished by adjusting the gate opening at the trap or varying the speed of the conveyor belt. When the binder was properly pulverized, no difficulty was experienced in adding fines to the gravel by a separate conveyor. The most satisfactory results were obtained with a slow-moving binder conveyor belt.

In a few cases unsatisfactory base material was produced. This occurred where there was poor synchronization between the aggregate belt and binder belt, when the binder was not properly pulverized or when care was not exercised in avoiding unsuitable material in the aggregate pit. In the latter case, this also occurred occasionally in pits where binder was not added. The field gradation tests did not always indicate the production of unsatisfactory base material because the quantity was usually small. Close visual and manual inspection is required to detect the presence of this material and to avoid recurrence of the condition.

Base Material Gradation

The gradations tabulated are the
(Continued on page 60)

★ Additional photos taken of Jeffries Construction Company plant. Link-Belt Speeder 3/4-yd. crane with Hendrix bucket loading pit gravel; Hough loader loading topsoil binder material onto auxiliary belt. (Roads and Streets photos, June, 1952)



KNOCKIN' Out the Yardage

S. E. Evans Const. Co. Moved 2,200,000 C.Y.

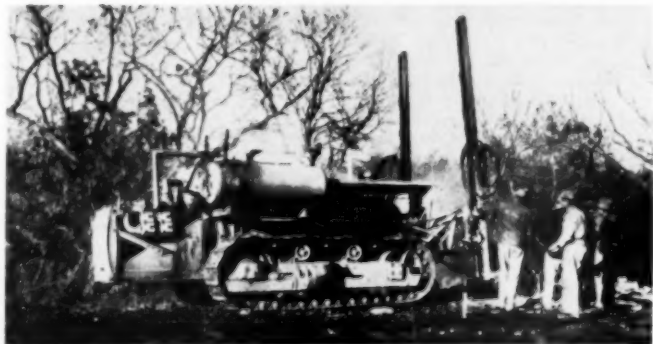
If you have the equipment, the rest is easy—that is, if you also know how. S. E. Evans Construction Co., Inc., of Fort Smith, Arkansas, invaded Oklahoma last year and took a 10.94 mile grading section of the big Turner Turnpike, three contracts in Lincoln County totaling 2,200,000 cu. yd. of excavation. According to S. E. Evans, "We began early in August, 1951, and moved 1,310,000 cu. yd. of rock and dirt through March, 1952. Since then we began using the full fleet herein listed, averaging about 200,000 cu. yd. per month with single 10-hour shifts."

The Evans equipment referred to included:

- 4 Caterpillar DW 21 scrapers
- 2 LeTourneau Model "W" scrapers



★ Superintendent Cranfill [center] flanked by assistants Kirkpatrick and Rich—on Evans' Turnpike job



★ Two "500" compressors and two wagon drills mounted on a D8 Caterpillar—one of the Evans machines on the turn-pike



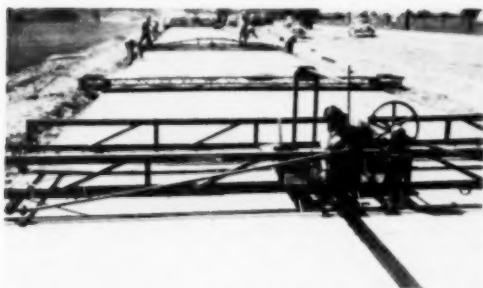
★ Big Contracting Model K-W ripper, mounted behind Caterpillar D8 pusher. Note also LeTourneau scraper, part of Evans fleet on the Oklahoma turnpike

- 1 LeTourneau Model "FP" scraper
- 1 Contracting Model K-W ripper
- 8 Caterpillar D8 tractors (one with "500" compressor and two wagon drills mounted on)
- 1 International TD 24 tractor with dozer (for pusher)
- 2 Caterpillar No. 12 motor graders
- 1 LeTourneau K-30 roofer

Miscellaneous equipment including rippers, rollers, trucks, etc. Orvil Cranfill was job Superintendent; E. A. Kirkpatrick, ass't. superintendent; Don Rich, master mechanic.

★ Oiler working near sun-down on S. E. Evans job. Note parts and office trailer in rear. (Right): Two Caterpillar DW-21's, one being pushed by an International TD 24.





★ Buckeye finegrader and centerline black-stripping machine seen on Rieth-Riley contract, U.S. 41, Indiana

Rieth-Riley Does Job 2 Months Ahead

With 213 working days allowed in the contract, only 150 days were required for Rieth-Riley Construction Co., of Goshen, Indiana, to complete a road job last summer. The contract was for grading and paving 2.4 miles of dual-lane highway on U.S. 41.

Quantities included 220,000 cu. yd. of grading and 76,000 sq. yd. of 9-7-9-in. concrete 24 ft. wide with 6-in. granular base. The earthmoving was done with 5 Super C Tournapulls with 2 Allis-Chalmers HD 19 push tractors, 3 Caterpillar D8 tractors with Le-Tourneau scrapers, 2 Caterpillar No. 12 motor graders, and miscellaneous supporting units. One Koehring 34E Trin-batch paver, one Blaw-Knox spreader, one B-K finisher, one Koeh-

ring Longitudinal float put down the concrete. Photos identify some of the other equipment used. Harold L. Bowen, superintendent; M. Bale, office manager; Charles Smith, Don Smith and Jim Blevins, foremen.

1,000,000 C.Y. Moved in 60 Days

A top yardage run of 500,000 cu.yd. of earth and rock per month for two consecutive months, was reported by Leonard-Slate-Hall Co. of Portland, Oregon. The job was the relocation of sections of Highway 58 and the Southern Pacific Railroad; a Corps of Engineers project necessitated by the building of Lookout Point Dam.

Of the 4,000,000 cu.yd. in the job, about 1,500,000 cu.yd. was solid rock. The job included placement of crushed

rock subgrade for the railroad bed. Chief equipment consisted of five 2½-yd. Bucyrus-Erie and Northwest shovels; five 500-cfm. Gardner-Denver compressors; 12 assorted wagon drills; 12 jackhammers; twenty Caterpillar D8 tractors; ten tractor-drawn scrapers; ten Euclid 20TD dump wagons; and 15 Tournapulls with either pans or end-dump wagons.

F. E. Anderson was general superintendent; Harry Mitchell, ass't supt.; Jules Ringsmeyer and Ole Jeldness, foremen; Tom Beveridge, expeditor.

●
Capt. Eberling Returns to Caterpillar. Herman G. Eberling has returned from Army duties to be assistant manager of the Plains sales division of Caterpillar Tractor Co. Gordon Fowler resigned as assistant manager to join Burford-Toothakes Tractor Co., the Caterpillar dealer at Birmingham, Ala.



★ These four pictures were taken on the Leonard-Slate-Hall job in Oregon

Bigger, Clearer Signs

Pennsylvania concentrating first on continuous routes, among features of a 5-year state-wide program

By H. W. Evans

Traffic Engineer, Pennsylvania
Department of Highways, Harrisburg

NEW and enlarged signs are now being placed along Pennsylvania's 41,000 miles of State Highway System. This is the result of long studies of both present traffic conditions and new materials now available for traffic signs. Extensive analyses of traffic and accident data indicated a definite need for larger signs than those which have been used in the past, also for signs that are reflectorized for night-time visibility.

Scope. There are approximately 800,000 traffic signs erected on our State Highways. This does not include signs posted on township roads or local municipal streets which are not State routes, or not maintained

by the Pennsylvania Department of Highways. Because of the enormous costs involved in buying new signs and scrapping old signs, it would be impractical to change over this many signs at one time. The reconversion will be done in stages extending over a period of about five years. Major routes and arteries are being re-signed first. Old signs removed from these routes will be used on secondary highways until they are no longer in usable condition.

Continuous Routes First

Continuous routes, however, are being selected to completely re-sign at one time. The first of these, U.S. Traffic Route 11, running North and South through the central section of Pennsylvania, from Maryland to New York state lines, has just been completed. This route, which crosses 13 counties, is 250 miles in length and required an average of 12 signs per mile. Reconversion started in each county at approximately the same time and required two months to complete. U.S. Traffic Route 19, located in the western section of the State is scheduled for reconversion during August and September.

Design of Signs. Wherever practi-

cal the designs for the new Pennsylvania signs follow the American Association of State Highway Officials recommendations. The "Warning" type signs, however, are 30"x30" which is 50% larger than national standards as well as the Pennsylvania older type signs. Where special emphasis is needed, large metal background signs are used with 30"x30" Warning Signs. These backgrounds, which consist of 60"x60" sheet metal (12-gauge) are covered with alternate black and reflectorized yellow stripes. Warning Signs are mounted in the center of the background face.

Directional Signs which, prior to this time, consisted of painted boards 6"x36" are now being constructed of 18-gauge metal in three standard lengths—45", 56" and 72". This represents up to 260% area increase over the older type signs. To obtain rigidity, the top and bottom edges have been bent to form a channel behind the face of the sign. Ends have been bent back 90° to the face of the sign to cover ends of the channels. Keyhole slots have been punched in the rear section of these channels in order that bolts can be inserted for mounting the signs



★ New larger route markers, compared with old, in Pennsylvania's sign replacement program



★ Directional signs are also being made larger—each is 11 x 72 in., and reflectorized



★ Special intersection warning sign, designed for high target value, used where needed



★ Diamond-shaped "warning" type signs are being made larger, with backgrounds reflectorized rather than depending on buttons—for greater target value and night-time visibility

to wooden posts. This method of mounting eliminates the necessity of boltheads protruding on the face of the sign.

Mostly Reflectorized

All signs, with few exceptions, are reflectorized with a background reflective material. A reflective background not only develops the night time appearance of the signs very similar to the day-time appearance because the shape of the sign and color are retained, but the target value is superior to the older type signs with reflecting letters. Except for Directional Markers, signs are constructed of flat sheet metal. These are less costly per square foot than embossed signs with reflectorized letters and it is believed that maintenance will also be lower.

Cardinal Markers. As part of this sign program, a study of route markings was recently completed in and adjacent to cities and large boroughs throughout the State to determine what could be done to improve markings in these areas. As a result of these studies Cardinal Markers, showing direction of travel North, East, South or West, will be placed at intersections, particularly in built-up areas, where motorists are likely to become confused as to the correct direction in which to proceed. Over 3400 of these markers will be placed during July and August.

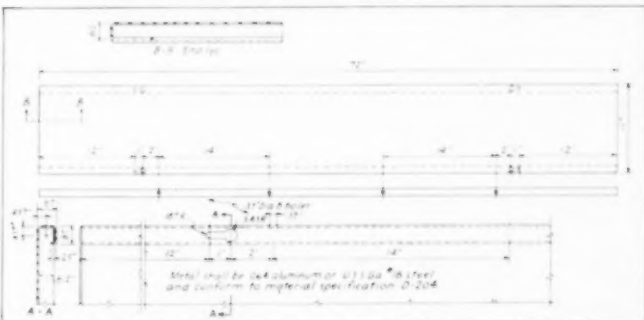
Mounting Route Markers. Welded route marker brackets are being tried at heavily travelled intersections in various sections of the State. These brackets, which can be mounted on pipe posts, will carry all route markers and all auxiliary route signs such as direction arrows, cardinal markers, etc., that are required at any specified point. They are so designed that with the use of interchangeable extension bars, any combination of U.S., Penna. or auxiliary route signs can be used. Main advantages—up to 6 route markers and 12 auxiliary route signs can be mounted on a single post assembly quickly and with proper spacing between signs. Also signs will be mounted in a horizontal rather than

a vertical position where there exists sufficient space to do so. Brackets are provided for both the standard size (16"x16") and the oversize (24"x24") route markers. Oversize route signs, which have 120% more area than standard signs, are used only where special emphasis is required and at important intersections of main travelled routes.

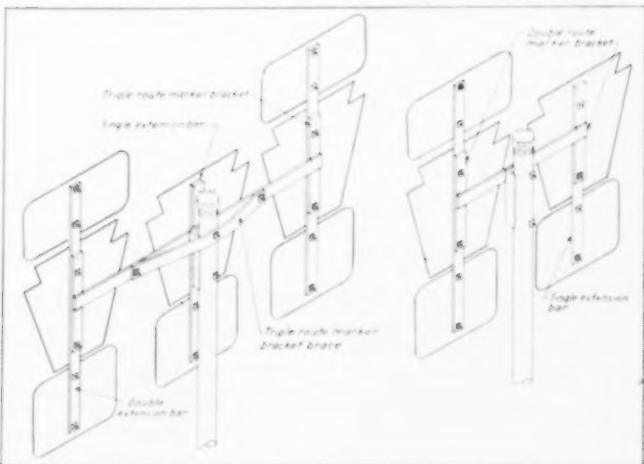
Pavement Markings. Supplementing these signs will be reflectorized pavement markings. In the past, reflectorized lines were used only on

major routes. Beginning this year, however, all pavement markings will be reflectorized.

It is believed that a planned program such as this will provide improved and consistent highway signing not only on our newly-constructed highways and major routes but also on our secondary highway system throughout Pennsylvania. It is hoped that as an end result, there will be fewer moments of indecision on the part of the motorist and therefore fewer accidents.



★ Details of rolled-edge destination sign—no rivets or bolts show on face of sign



★ Mounting bracket details for triple and double route marker assembly—Pennsylvania department of highways



★ Six to 12 snow ridges such as the three seen in the left half of this picture were plowed to protect U.S. 14 west of Pierre, S.D. See bare pavement at right

Snow Windrows

Proved Worth Again in South Dakota

THE exceptionally heavy snow last winter in South Dakota, which reached 93 inches at Pierre (and brought the great spring flood in the Missouri), was a severe test of men and machines. This summary will not attempt to outline fully the details of how the state highway maintenance forces mobilized to keep the roads open. Rather, it spotlights a few points of special interest.

The heavy snows in some cases contained more moisture than is normal for an entire year's rain and snow in South Dakota. The quick melt was a factor in the all-time record flood of the Missouri River in April.

The bad winter scored a direct hit also on the South Dakota state highway commission's 1952 budget. The winter's snow removal bill came to three times normal, or \$800,000 more than had been set aside in anticipation of an average winter; all men and equipment worked longer hours to keep roads open, through repeated storms that occurred from early December through April. This expense was followed by the severest and most widespread spring break-up damage on record, further biting into the funds for an emergency-sized spring repair and summer maintenance program.

The result was a curtailment of new construction for the season to make funds available for the emergencies.

The most noteworthy detail of procedure in the department's snow fighting is its widespread use of snow windrows. While not a novelty any more, the technique is newsworthy for again proving its value in a wind-swept prairie country such as South Dakota. Snow windrows, according to Leo A. Ihli, state maintenance engineer, consist of combination windrows and trenches plowed progressively in the fields parallel to drift spots along the highways. They are considered an excellent substitute for snow fence, often costing less than fence and doing a better job.

In constructing a snow windrow, the operators first go in with motor graders or truck plows, following a snowfall of 5 or 6 inches. With each succeeding snowfall, the windrows are enlarged until they may reach a height of 6 or 7 feet. Sometimes in areas where drifting is known to be exceptionally severe, two or more parallel windrows are built.

The cost is much less than the cost of plowing snow repeatedly from an unprotected road. During the last two or three years over 300 miles of wind-

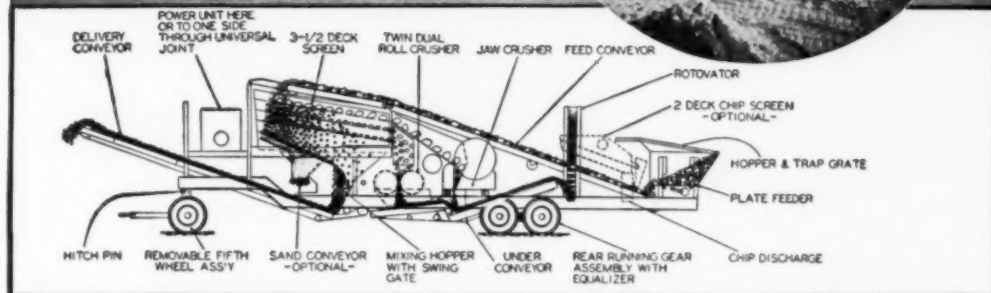
rows have been built up each winter. Over the past score of years they have been found especially valuable along stretches of road in the range country, where the wind gets a full sweep. Pushing up a windrow takes little time, and when the melt comes there is no fence to take up. Combined with about 300 miles of fence considered the best solution for other areas, about 600 miles of the state highway system have some kind of drift protection.

Over 300 Units

The South Dakota highway commission's equipment for snow removal and winter maintenance includes more than 300 trucks and other units. Most of this fleet has been replaced since the war, and only recently several new trucks were added, together with a motor grader mounted rotary or blower unit. The state has 12 rotaries, several wideners with rotary units in the wings, and two blower attachments for mounting on wings on a motor grader. Equipment is deployed among 100 communities over the state at the beginning of the snow season, and may be transferred from one district to another to meet regional emergencies, as was the case last winter.

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| Charging Hopper..... | 2 1/2 yard |
| Feed Conveyor..... | 30" CF |
| Under Conveyor..... | 30" CF |
| Front Delivery Conveyor..... | 30" CF |
| Sand Delivery Conveyor (optional)..... | 18" CF |
| Swivel Feed Conveyor (optional)..... | 30" x 32' LF |
| Rotator..... | 18" x 7'-9" dia. |
| Tires..... | 8.25 x 20 10 ply (12) |
| Brakes (optional)..... | Air-Vacuum-Mechanical |
| Width..... | 8'-0" |
| Operating Length..... | 53'-3" |
| Height set up..... | 12'-6" |
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| Weight basic plant..... | 49,600 lbs.* |
| Power required..... | 115 H.P. Continuous Diesel or equivalent |
| Rated Capacity tons per hour 1" minus material based upon 25% crushing..... | 125-220 |

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★ The 1951-1952 winter's snow of 80 to 90 inches brought such deep drifts that they had to be "skinned" first with dozers to make push plows effective. Photo: north of Gettysburg, S.D.

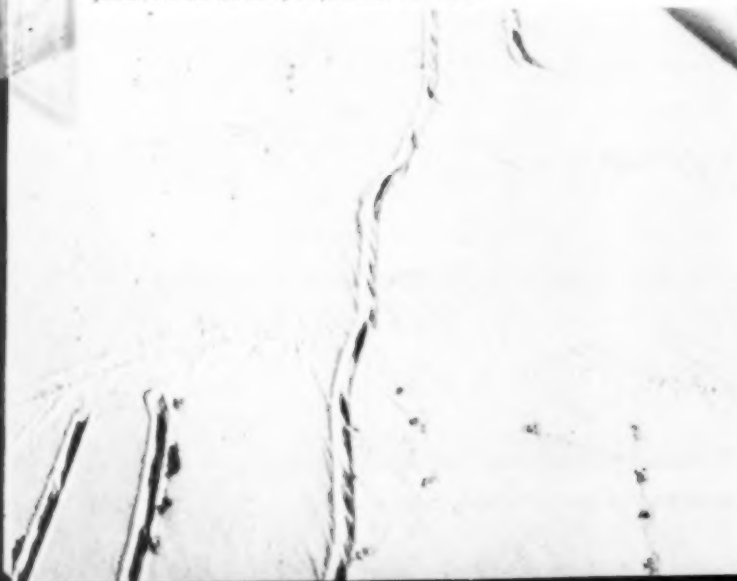


★ Another field full of windrows. Note nearly bare ground between last windrow and highway at right

Last winter the state and the counties cooperated to a new extent, and a number of contractors supplied men and machines on a rental basis to open up isolated ranches and communities. In one county, Brown county, 37 tractors and operators, paid on hours of running time, were used to open up the roads without delay after an exceptional storm.

The South Dakota maintenance

★ The South Dakota plow crews traveled thousands of miles over frozen stubble fields to make windrows or open access roads to ranch houses, stock, feeding grounds, etc. Old and new plow paths seen from the air



forces comprise one of the nation's big users of radiotelephone and one of the most enthusiastic. Over 100 trucks and foremen's cars are equipped with two-way radio. These are tied in as a part of the South Dakota state police radio system comprising 300 mobile units, 80 stationary units and 11 broadcast or repeater units. Plow operators are thus in touch with patrolmen, supervisors, engineers, game

wardens, sheriff's offices, and of course the state police.

This system makes it possible for Mr. Ihli to direct plowing and rescue operations in any part of the state from his office. The radio units have paid for themselves in making possible a new efficiency of management and speed and flexibility of service to the public. Radio has revolutionized the hour-to-hour direction and development of equipment, and saved much time in reaching breakdowns, supplying parts, etc.

Airplanes also figure in the snow fighting in this state. The state aeronautics commission owns a four-seat plane, also radio-equipped, which was made available last winter again for inspecting conditions from the air, spotting windrow locations, checking bridges, and directing drift-opening or rescue work.

Pennsylvania Again Leads in Construction

The Pennsylvania Department of Highways was again the No. 1 road building agency among the states in 1951 with \$194,340,000 of construction project expenditures. This is \$87,000,000 more than the neighboring state of New York and \$108,000,000 ahead of California, third ranking state.

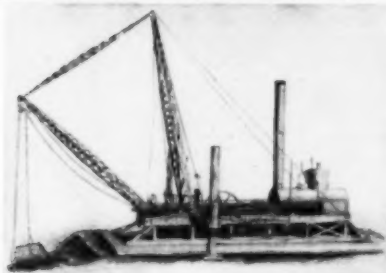
Pennsylvania's Department has jurisdiction over 41,000 miles of road including many which would be classified as county roads in other states.

Manufacturers News

Blaw-Knox Division Changes. S. M. Pare has been appointed assistant manager of the construction equipment department of Blaw-Knox Division of Blaw-Knox Co., Pittsburgh, Pa. Increased business in the steel forms department will require L. J. Sarosdy to devote full time to his position as manager and chief engineer of the steel forms department and to relinquish his duties as chief engineer of the construction equipment department. He will also serve as engineering consultant on construction equipment. C. F. Mittelstadt has been promoted from assistant chief engineer to chief engineer of the construction equipment department.

Hough Co. Wins Advertising Award. At the recent annual convention of the National Industrial Advertisers Association first prize in the Putman Awards for the best use of industrial advertising went to The Frank G. Hough Co., Libertyville, Ill. A \$1,000 presentation was made to Raymond P. Wiggers, advertising manager of the firm and a \$750 award was made to Ray B. Thomas, account executive of its agency, Erwin R. Abramson, Advertising, of Milwaukee, Wis. Since the Hough entry also won first prize in 1950, this company and its agency became the first to win the Putman Award twice.

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★ Raising of final 400-ton span completes steelwork of Chesapeake Bay Bridge—world's third longest—near Annapolis, Md. Floating of 28 of bridge's big spans and 39 suspension bridge assemblies was largest flotation job in history of bridge-building.

Closure Truss Gets Dual Use on Chesapeake Bridge

STEELWORK of the 4-mile-long Chesapeake Bay Bridge was completed recently by Bethlehem Steel Company, upon erection of the final 400-ton deck cantilever truss span. Chesapeake Bay was thus spanned for the first time, linking the Del-Mar-Va peninsula to the mainland of Maryland.

The bridge is a vital segment of a north-south express highway route which will enable traffic to by-pass the cities of Philadelphia, Wilmington, Baltimore, Washington, and Richmond, Va.

The final truss span, 360 ft. long and 40 ft. deep, had been used as falsework or dock upon which a num-

ber of the bridge's other spans were erected and floated into place. Its dual use—as falsework and eventually as part of the bridge itself—was one of a number of improved techniques devised by engineers in placing the 33,000 tons of steel for the bridge.

Flotation barges lifted the span off the pile bents on which it rested a mile from the western shore. It was then towed almost a mile east by tugs to its position at the eastern extremity of the suspension bridge section of the bridge. Wire rope tackle on the bridge lifted the span up to the roadway level, 180 feet above the water.

A flag raising ceremony prior to the lifting operation was led by Mrs. John H. Wagner of Bethlehem, Pa., wife of Bethlehem Steel's general manager of erection. Mr. Wagner supervised erection of the bridge's 33,000 tons of steel.

Floating of 21 of the bridge's 25 big truss spans, which ranged in weight up to 930 tons, comprised the largest series of flotations in the history of bridge-building. The floating operations took about 17 months.

2922-ft. Suspension Span

Another spectacular phase of the bridge construction was erection of the 2922-ft. suspension bridge portion, completed a few days ago. The suspension bridge provides a vertical clearance of 193.5 ft. over the main Baltimore ship channel. Its center span of 1600 ft. is the longest of 123 spans in the entire structure. On either side of the big center span is a 661 ft. side span.

Instead of following the familiar spinning procedure, J. E. Greiner Company, Engineers, saved time by designing the suspension bridge cables of prestressed strands set to measured length. From the cables were hung completely pre-assembled roadway sections ranging from 40 to 80 ft. long.

Stiffening truss sections were assembled and stock-piled at a Baltimore pier. They were moved to the bridge site on car floats and joined with the floor system and top and bottom bracing to form complete roadway sections.

The 39 roadway sections, weighing from 50 to 125 tons, were lifted into position by sets of falls clamped to the main suspension cables. After the



★ One of the nation's great bridges nears completion. The new Chesapeake Bay Bridge near Annapolis, Md., shortens travel time between Del-Mar-Va peninsula and the mainland. Length is 21,286 ft. The 33,000 tons of steelwork were fabricated and erected by Bethlehem Steel Co. (United Press photo)

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load was transferred to the suspenders and chord sections were spliced, the remaining floor steel joining the roadway sections was set by deck traveler.

The two-lane bridge, with its 28-ft. roadway, lies 25 miles south of Baltimore. It is 21,286 ft. long and connects Sandy Point on the mainland with Kent Island on the Delaware-Maryland-Virginia peninsula. The first spans were erected in the structure in December, 1950.

When the bridge is opened to traffic, motorists heading south will be able to skirt big-city traffic by taking the New Jersey Turnpike and crossing the Delaware River by the Delaware Memorial Bridge, near Wilmington, Del.; proceeding down the Del-Mar-Va peninsula and crossing over the Chesapeake Bay Bridge; taking the Potomac River Bridge, and following Route 17 over the York River on the new bridge at Yorktown, Va.



William Arndt Dies; Engineer for Truckers

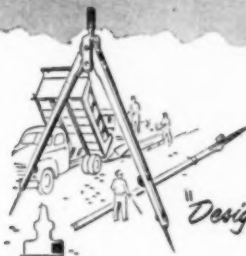
William J. Arndt, 45, chief highway engineer for the American Trucking Associations since last January, died recently. A Kansas State College graduate, Mr. Arndt was associated with the Kansas Highway Commission for more than 20 years prior to his ATA appointment. He was a regular contributor to **ROADS & STREETS**.

In 1937, the Commission appointed Mr. Arndt assistant materials engineer. In 1949 he was named director of highway research, the position which he resigned to accept the ATA appointment. Mr. Arndt was known in the engineering profession for his outstanding work on test roads.

New Joy Distributor. Florida-Georgia Tractor Co., 3139 N. Miami Ave., Miami, Fla., has been appointed distributor for southern Florida for the entire construction equipment line of Joy Manufacturing Co., Pittsburgh, Pa.



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Says K. A. Matheson of the above company, "In the City of Mission on the Fraser River, the MICHIGAN cranes did a splendid job owing to their mobility and being able to get from one break in the dikes to another in very short order. In particular the TLD-20 with remote control was a decided advantage, as it enabled us to do the same work with one less man when labor of this sort was badly needed on other flood-fighting work."

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Observations on Compaction

By W. G. Gordon

Principal Civil Engineer
Bureau of Yards & Docks—Soils Mechanics
& Paving Section

PROBABLY the most important accomplishment of the Paving Engineer to date in connection with the problems of compaction of materials is the realization of its importance in the design and construction of pavements. Certainly it cannot be said that the problems have been solved. As proof of this statement, the various methods of determining and controlling compaction now being used and the various methods of compaction being specified appear to be conclusive.

Practically every paving project presents somewhat different problems in compaction. In practically all cases, increased compaction or density will increase the load bearing capacity and stability of paving materials, but there is an economical limit to the compaction or density to be obtained. For the economical design of pavements, it is essential that the design engineer have complete information from field investigations of materials proposed for use.

Navy Uses Test Loads

The method of design used by the Navy Department is based on plate load tests made in the field on trial sections of pavements. These trial sections must be constructed of equivalent materials, thickness and densities as proposed for use in construction to be accurate. As in the case of the California Bearing Ratio tests, the results of these tests would be meaningless unless the degree of compaction of the materials used in the trial sections is controlled. If the densities obtained in the construction of the test sections are above those that may be obtained practically during construction, this would result in an under-designed pavement; likewise, if the densities obtained in the test sections are below those obtained during construction, this would result in an over designed pavement.

One of the most difficult problems in compaction of materials to the contractor and engineer is the lack of uniformity in the methods used in determining the maximum density. In most cases, the method of determining the maximum density of mate-

rials is the AASHTO Designation T99-49 Test, usually referred to as the Proctor Method. In most cases, it is necessary to modify this test to meet the actual job conditions; otherwise, satisfactory results may not be obtained. There are a number of modifications on test procedure that are used quite frequently. However, it would be more satisfactory if the modifications intended were completely spelled out in every case. As an example, the two different modifications most often used will at times result in approximately the same maximum density while with other materials, there will be a wide variation. In one of these procedures, only the following modifications are made in the Standard AASHTO T99-49 Test: (1) weight of the rammer or metal tamper is 10 pounds instead of 5½ lbs.; (2) the tamper is dropped from a height of 18 in. above the sample instead of 12 in.; and (3) the sample is compacted in 5 layers, each approximately 1 in. thick. With these modifications, only the material passing the No. 4 sieve is used and the 4-in. diameter mould requiring 25 blows per layer is used.

With the other modification, generally used in connection with the C.B.R. method of design, in addition to the first two modifications listed above, the following additional modifications are also made: (1) a 6-in. mould is used with 55 blows to each of five layers; (2) the material passing the ¾-in. sieve is used, replacing the plus ¾-in. material with an equivalent amount of material between the ¾ in. and No. 4 sieve, and (3) new material is used for each remoulding.

Since the compactive effort per unit of material is approximately the same for each of these modifications the same maximum density will be obtained with material, all or most of which passes the No. 4 screen. However, in other cases, the maximum densities may vary considerably using the different modifications. This is particularly true in blending material of different specific gravities, such as sand and slag, shell-rock and soil, crushed stone and soil, etc.

In some cases, neither of the above-mentioned modifications nor the standard test may prove satisfactory. When an excessive amount of breaking down of the material from the hammer occurs and a similar break down does not occur in the method to be used in construction, a different method of obtaining the maximum density should be adapted. In all specifications, the method of obtaining the maximum density of materials should be clearly spelled out in detail

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Simplifies loading and unloading of heavy drums, barrels, cartons, etc., with only one man. Powerful hydraulic hoist raises 1-ton loads from ground or dock to truck floor level in seconds . . . lowers loads gently to any level. Saves costly damage to cargo . . . avoids painful injuries and lost-time accidents to personnel.



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Pick-up Dump Pick-up Tail Gate Snow Plow Controls

to avoid misunderstanding during construction.

Field Densities

Similar to the various methods of determining the maximum densities of materials, the methods of determining the field densities are as numerous and probably more erratic.

The most generally used method is the Field Determination of Density of Soil in-Place AASHTO Designation T147. This method consists of digging a hole in the material to be tested and accurately weighing the material removed. The volume of the displaced material is then determined by refilling with oil or sand of known density and measurement of the amount used to refill the hole. This method is very satisfactory for some materials but in some cases it is anything but reliable.

Other methods of determining the field densities of materials are: removal of undisturbed samples and computing the volume by various methods, penetration devices, and too often the older and less accurate methods of guessing.

The methods of accurately determining the in-place densities of materials cannot be considered any more satisfactory than the methods of determining maximum densities and

are even more dependent on the human elements involved.

During the past 25 years, many different types of equipment have been produced to obtain greater densities at less cost. Prior to the early thirties, about the only equipment in use for compaction purposes was the smooth-wheeled steel rollers and in some cases controlled traffic during construction. As with practically all other later developments, these methods had varying degrees of success. In 1930, several state highway departments required all soil and macadam bases to remain open to traffic for a period of 30 to 60 days prior to the placing of the wearing surface. When suitable weather conditions prevailed and sufficient traffic used the road, excellent results were obtained with very little cost attached. While some excellent results were obtained both in uniformity and degree of compaction by controlled traffic, the safety, comfort and cost to the traveling public were not considered.

Pneumatic Rolling Began

The successful use of controlled traffic in obtaining the compaction of subgrades and bases during the early thirties led to the development of rubber-tired rollers. Prior to the

war, most rubber-tired rollers were relatively light and were used to compact the top 3 or 4 inches of material. Since the war, investigations have shown that increased weights and higher tire pressures will increase the effective depth of rubber-tired rollers. This has led to the development of many different models of rubber-tired rollers, affording valuable competition between manufacturers in reducing the cost of obtaining the compaction required.

During the same period, the development of various types of tamping rollers has paralleled the developments in rubber-tired rollers. In general, increased weight and decreased speed of operation has produced higher densities. As in the case of rubber-tired rollers, the competition between manufacturers in reducing the cost of obtaining the compaction required has been very beneficial.

During the last few years, numerous investigations with vibratory equipment for obtaining increased densities with granular soils and bases have been made. Numerous examples of the advantages of this method can be cited from actual conditions prevailing at airports constructed on these types of soils and bases.



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In some cases, usually under flexible pavement, the vibratory solidification effect of planes on the pavement has increased the load carrying capacity of the pavement as much as 55% over a period of 4 or 5 years and can only be considered beneficial.

Traffic tends to compact the base, subbase and subgrade evenly and uniformly in flexible pavements. Under rigid pavements, the effect is the opposite since compaction by vibration is never uniform and usually results in cracks of unsupported slab corners and edges and complete failure of the pavement in these areas. As in the cases of rubber-tired rollers and tamping rollers, the development of vibratory equipment opens up another field of healthy competition for equipment designers and manufacturers.

Anderson and Arms Promoted at PCA

A. A. Anderson, former manager of the Highways and Municipal Bureau of the Portland Cement Association and nationally known technician in the concrete paving field, has been appointed Chief Highway Consultant of the PCA, with headquarters at the Association's general office, 33 W. Grand Ave., Chicago. He is succeeded by L. M. Arms, former assistant manager of the Highways Bureau, according to C. D. Franks, PCA executive vice president.

Mr. Anderson joined the PCA in 1923 and has been Highways Bureau manager since 1936. In his new capacity he will handle special assignments of national importance in the paving field. He served the Kansas State Highway Commission as a division engineer prior to joining the Association. A member of the American Society of Civil Engineers, he was awarded the Arthur M. Wellington Prize for the most valuable paper on transportation presented before the Society in 1950.

Mr. Arms joined the Association in 1932, having previously served as Assistant District Engineer in the Illinois Highway Department and engineer of design of the Cook County (Ill.) Highway Department.

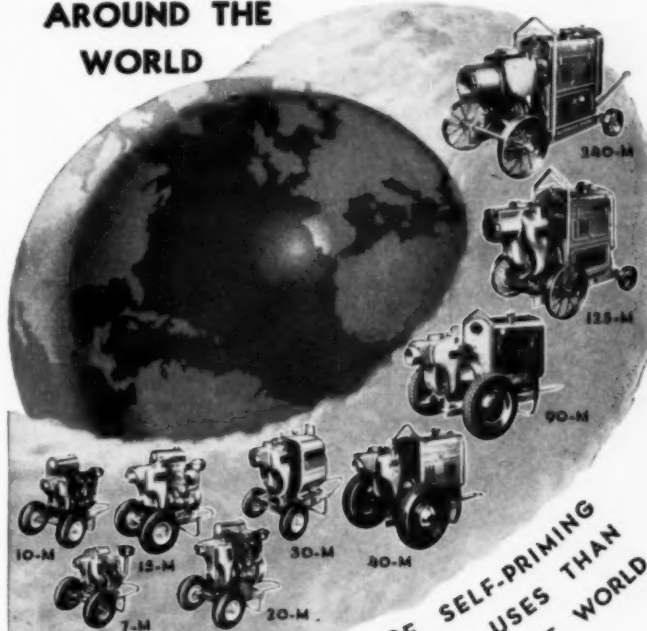
Barr Heads Michigan County Road Group

John H. Barr has been appointed engineer-director of the County Road Association of Michigan, according to an announcement of F. Medalie of Traverse City, Association president. Mr. Barr succeeds the late A. O. Cuthbert.

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They will pump more dirty water, more hours, with less fuel, will prime quicker and at higher suction lifts than any other comparable self-priming pump. And -- Gorman-Rupp pumps are guaranteed in plain language by us and our distributors.

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A Complete Line of Engine Powered and Electric Motor Driven Self-Priming and Non-Self-Priming Centrifugal Pumps.

THE GORMAN-RUPP COMPANY
MANSFIELD, OHIO

Base Construction Reviewed by Minnesota

(Continued from page 43)

averages of tests run in the laboratory on samples submitted by project engineers. The minimum and maximum percentages passing the three critical sieves are also indicated.

The averages show a general compliance with the gradation specifications although there are individual tests that show high percentages passing the No. 10 sieve and a few that show an excess passing the No. 200 sieve. Non-uniformity of the material

in the aggregate source, and the presence of pockets or layers of unsuitable material, were responsible for the production of most of the materials that failed to meet the specification. The consequence is the presence of localized areas of potential weakness in the base structure. Such occurrences can be reduced by more careful pit control.

The ratios, obtained by dividing the percentage passing the No. 200 sieve by the percentage passing the No. 40 sieve, are quite generally satisfactory.

As a result of the general concerted effort to avoid plastic mixtures, the minimum requirement of 3%

passing the No. 200 sieve was not attained consistently on a number of projects. This was not serious but it is desirable to produce material that meets this requirement if it is possible to do so.

Plasticity Index

The specified Plasticity Index was exceeded by one or more samples on only a few jobs. Most of the base material produced in 1951 was non-plastic or slightly plastic. Since there is no plasticity test used in the field, the plasticity was controlled by visual inspection. Plastic base materials were corrected when discovered, but it should be assumed that a few areas of potential base weakness still remain where plastic base materials were placed unobserved for lack of experienced inspection personnel.

Density and Compaction

The average relative densities indicate general compliance with the specifications, although there is considerable variation between the minima and maxima. Low relative density values in sections that were recompacted are not included in the tabulation.

There is wide variation in the relative density test values and many are higher than it is reasonably possible to obtain. This indicates that more care should be exercised in making the tests. Much of the variation in results can be attributed to lack of testing skill of the inexperienced personnel.

In spite of the lack of consistency in the field density tests and the field moisture-density tests, the desired consolidation was generally obtained in the 1951 season. These tests for the control of compaction also have considerable educational value by revealing to the inspector many of the characteristics of the materials being used in the base construction.

Where there was coordination of operations and sufficient watering and compacting equipment, no great difficulty was experienced by the contractors in obtaining proper consolidation although on some projects impediment of compaction was experienced due to softening of the base and subgrade during excessive wet weather.

The best results were obtained where the length of windrows was not excessive and the length of the section to be compacted was limited with relation to the weather and available equipment.

The consolidation of the sub-bases, carried on under the method of ordinary compaction, was generally good.

Base Stability

The function of the base on most

On the New Jersey Turnpike it's



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projects is to support a bituminous surface. For this purpose the base materials should consolidate well under the compactive effort and, after proper consolidation, have the properties of resistance to the accumulation of moisture, to deterioration from moisture, to percolation of moisture and to deformation under loading.

The gradation of the base material reflects to a considerable degree the "stability potential" of the material. In this connection, the following general values are desirable but not often obtainable economically, in their entirety, in one product:

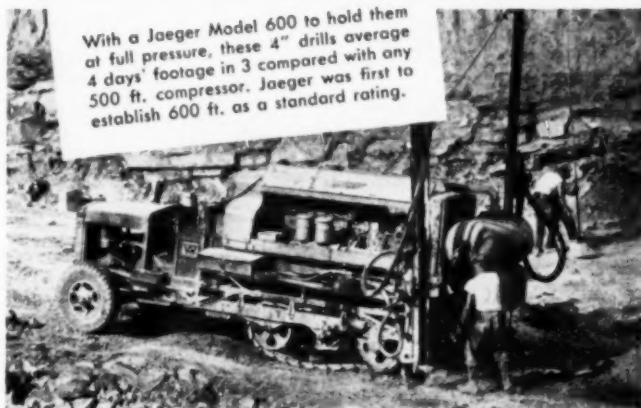
1. Per cent passing the No. 10 sieve
— approximately 45
2. Per cent passing the No. 200 sieve
— 3 to 6
3. Ratio 200/40
— 0.20 to 0.30
4. Plasticity index
— slightly plastic to non-plastic
5. Maximum density
— over 135 lb. per cu. ft.
6. Optimum moisture
— approximately 7% to 8%

Relatively coarse non-plastic gravel materials require considerable moisture to reduce the high internal friction in order to facilitate the movement of the particles into a dense position. These materials are generally satisfactory for base because the same inherent characteristics that resist consolidation also resist deformation under traffic loading. These materials do not have capillary properties nor do they generally have an affinity for moisture, but they have the disadvantages of porosity when deficient in fines.

Base materials, with a relatively high content of plastic fines, are easier to consolidate because the cohesive materials are lubricous when moist and tend to decrease considerably the internal friction. These materials must be properly densified to develop stability because the same inherent characteristics that facilitate consolidation tend to facilitate deformation and additional consolidation under traffic loading. The presence of considerable amounts of coarse materials tend to decrease the adverse effects of high plasticity, but, if the material is deficient in coarse particles, the internal friction is low. These materials (relatively high in plastic fines) have the advantage of being impervious to the percolation of moisture when properly densified, and resist wear from traffic, but have an affinity for subgrade moisture and are subject to deterioration from freezing and thawing if fine-textured.

Fine gravel materials that are non-plastic are likely to be porous and have low internal friction. These ma-

40% more footage with JAEGER air-plus pressure

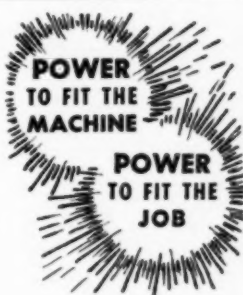


With a Jaeger Model 600 to hold them at full pressure, these 4" drills average 4 days' footage in 3 compared with any 500 ft. compressor. Jaeger was first to establish 600 ft. as a standard rating.

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4 days' work in 3 is possible on many jobs where Jaeger's increased "new standard" ratings step up the speed and hitting power of air tools. A Jaeger 75 will efficiently run one heavy breaker. A Model 125 will run two. Jaeger's 185, 250 and 365 ft. models deliver 25 to 50 cfm more air than "old standard" compressors to run larger tools at full efficiency.

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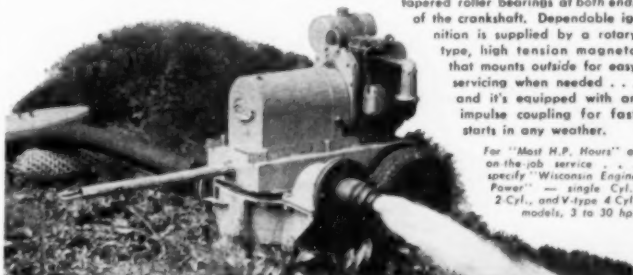


WISCONSIN-POWERED Rex Pump

Designed to meet de-watering requirements in which large amounts of solid materials are present, this 4" Closed Diaphragm Rex Pump will handle up to 6,000 gals. per hr. on a 10-ft. suction lift. It's built by Chain Belt Co., Milwaukee, and powered by Model AKN 4-cycle single cylinder Wisconsin AIR-COOLED Engine, turning up 3 1/2 hp. at 2100 rpm.

Like all Wisconsin Air-Cooled Engines, from 3 to 30 hp., this rugged little power unit runs on Timken tapered roller bearings at both ends of the crankshaft. Dependable ignition is supplied by a rotary type, high tension magneto that mounts outside for easy servicing when needed . . . and it's equipped with an impulse coupling for fast starts in any weather.

For "Most H.P. Hours" of on-the-job service . . . specify "Wisconsin Engine Power" — single Cyl., 2 Cyl., and V-type 4 Cyl. models, 3 to 30 hp.



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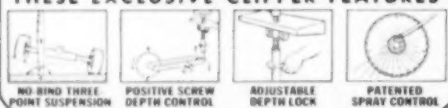
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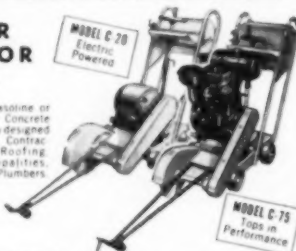
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materials are subject to deformation unless properly confined.

An examination of the tabulation reveals that there is a wide range of variation in the gravel base gradations. This would indicate that there is also a considerable difference in the "stability potential" of the materials placed on the various projects. The performance of the various base structures will also vary, depending upon the volume of traffic and other factors. It is evident that the surface thickness requirements will also vary, depending on the "stability potential" of the base material, because the resistance to deformation in a completed base depends to a considerable degree on the confining effect of the surface mat.

New "Good Roads" Group Formed

Completion of preliminary steps leading to the formation of a National Good Roads Association was announced recently in a joint statement issued by the Executive Directors of five state Good Road Associations. The organizing committee, which made the announcement, consists of Ike Ashburn, Executive Vice-President, Texas Good Roads Association; Lawrence Rubin, Director, Michigan Good Roads Federation; Edward Konkol, Executive Secretary, Wisconsin Good Roads Association; L. Judson Morhouse, Executive Director New York Good Roads Association; and G. W. Price of the Minnesota Trunk Highway Federation and the Minnesota Good Roads Association.

An organization meeting of the new association was scheduled to be held at Washington on August 11, where further details will be completed. An invitation to participate in the formation and activities of the National Good Roads Association has been issued to all state organizations which are primarily interested in better highways.

The purpose of the new National Good Roads Association, it was said by the Committee on Organization, is to provide a bridge between state and national efforts to solve our serious highway problem. National efforts are ineffective because of the lack of specific approach. State associations, on the other hand, need the support which national organizations, and firms of national scope, can give to them.

It is not the intention of the new National Good Roads Association, the announcement said, to supersede any effort now being made for highway improvement. Its primary purpose is to assist all who are already working for a better highway system in cooperating more effectively.

Main Objectives

Tentative purposes of the National Good Roads Association were announced as follows:

1. To bring the demand for good roads into focus at the state level, which is where roads are primarily financed and actually built.
2. To assist properly qualified state organizations which are working for better roads to obtain the cooperation of national organizations, and firms of national scope.
3. To assist national organizations, and firms of national scope, to coordinate their efforts for better roads with those of state groups having a similar purpose.
4. To provide representation at national level for state organizations interested in good roads, to the end that highway transportation may receive consideration in the form of Federal Aid in reasonable proportion to that which it receives as a source of tax revenue.

5. To support the theory of "home rule" for state highway administration.

It is the proposal of the Organizing Committee that the dominant voting power in the National Good Roads Association shall be given to those organizations which, in turn, are actually dominated by a truly representative public membership in their own states.

"We believe that well-educated public opinion, expressed at state level, is the key to our highway problem," the Committee stated. "We intend that the National Good Roads Association shall assist in making this opinion not only vocal, but also well informed."

The temporary address of the National Good Roads Association is 7th Floor, 1325 E Street, N.W., Washington 4, D. C. L. Judson Morhouse, Executive Director of the New York Good Roads Association, is the acting secretary for the Committee on Organization, and correspondence on the New Association should be addressed to him at that address.

Safety Data Issued for N. J. Turnpike

With traffic volumes on its 118-mile highway hitting new peaks monthly, the safety record of the New Jersey Turnpike continues to reflect a better condition than exists on the nation's highway system, it was announced by the New Jersey Turnpike Authority. Almost 7,800,000 vehicles traveled on the New Jersey Turnpike in this year's first half, covering approximately 342,000,000 miles.

For the first six months of this year accidents on the Turnpike totaled 311 which, using the standard formula of the federal and state governments, equaled 90.7 per 100,000,000 miles of



★ Harry Radcliffe, appointed West Virginia Road Commissioner effective July 1, 1952, succeeds Ray Cavendish who resigned to become Executive Director of the West Virginia Turnpike Commission. Mr. Radcliffe is a 30-year man with the State Road Commission July 1 this year.

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To dewater this 58' x 15' pier cofferdam to 18" depth and keep the gravel bottom drained, these Jaeger pumps operated continuously more than 500 hours, often repriming as frequently as every minute, and never, at any time, ran faster than an easy 1400 rpm. Pumps that must race at 1800 to 2000 rpm to meet these same conditions can never give you the sustained performance and years of service you get from a Jaeger "Sure Prime."

Compare pumps before you buy:

The Jaeger has a larger shell and impeller, two independent priming actions, the only positively lubricated seal and the largest engine applicable. More pump for your money; more pump on your job.

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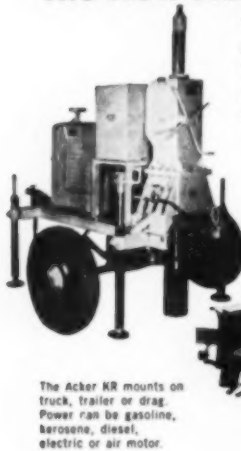
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It takes only one man to operate it yet it handles 3 to 5 yards per minute of any loose material—Coal, cinders, dirt, snow, etc. Gets from job to job at truck speeds. Send for folder 252-132 and get more information.

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The Acker KR mounts on truck, trailer or drag. Power can be gasoline, kerosene, diesel, electric or air motor.

The new Acker KR SHOT CORE DRILL is especially designed for obtaining clean, unbroken highway test cores quickly, inexpensively—accurately.

For economy, inexpensive steel shot does the cutting, reducing bit servicing and operational expenses.

Improved Acker design assures clean-cut core recovery up to 20" in diameter even from steel reinforced concrete.

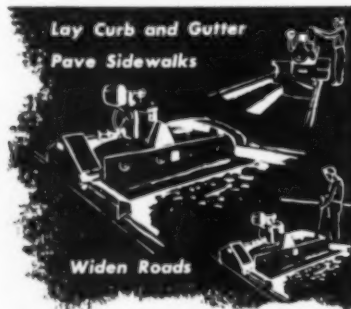
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Manufacturers of diamond and shot core drills and supplies.

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Contractors everywhere are boosting production, saving time, cutting costs, with Dotmar Curb and Gutter Pavers. Paves 5 to 10 linear ft. per min. Lays any shape curb and gutter, and sidewalks up to 60" wide, or integral, curb, gutter and sidewalk simultaneously. Tamps concrete ahead of screed. Pays for itself in first mile of curb and gutter paved. No face forms to set in curb work. Self-powered—as few as 3 men can operate. Send for Bulletin 52

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KALAMAZOO, MICH.

travel. This figure of 90.7 compares with 418, on the same mileage basis, on New Jersey's highway system for all of 1951, the latest figures available. Thus, in this regard, the Turnpike safety record was substantially better than that on public highways.

From the standpoint of fatalities, the Turnpike's record in the first six months equaled 4.1 per 100,000,000 miles of travel against 4.4 for the State's public highways and 7.7 for the national highway system for all of 1951.

The unfortunate occurrence of two accidents on the Turnpike in the early morning hours of July 4, causing the deaths of seven persons, had the effect of marring, currently, the fatality ratio because of the small mileage accumulated since June 30.

Recent ARBA Literature

"Directory of Highway Officials and Engineers." Complete roster of executive names. Address American Road Builders Association, International Building, Washington 4, D. C. Available to members and non-members at \$1.00 per copy.

Recent technical bulletins of ARBA available to members and non-members are as follows:

"The Value of Welded Wire Fabrics in Concrete Slabs," by D. W. Carlton, Professor of Structural Engineering, Missouri School of Mines and Metallurgy. Technical Bulletin No. 182. One copy free to ARBA members; 25c per copy to non-members.

"Looking Ahead With Soil-Cement in Louisiana"; "Reconstruction of Lubbock Airport With Soil-Cement." Technical Bulletin No. 183. Two reports sponsored by ARBA Committee on soil-cement stabilization. One copy free to members; 25c each to non-members.

"Experimental Use of Lime for Treatment of Highway Base Courses"; by Ernest Zube, Senior Materials and Research Engineer, California Division of Highways. Technical Bulletin No. 181. ARBA Technical Bulletin No. 181. Single copy free to members; 30c per copy to non-members.

"Developments in Iowa Secondary Road Soil Stabilization"; by L. M. Clauson, Director, Secondary Road Surfacing Problems, Iowa State Highway Commission. Technical bulletin No. 184. Single copy free to members; 25c per copy to non-members.

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Bituminous

ROADS AND STREETS



Cover Scene

Shoulder widening strips constructed with crushed stone and emulsified asphalt. Coated with light colored chips to mark pavement edge pending full-width resurfacing—North Carolina, U.S. 64, May, 1952

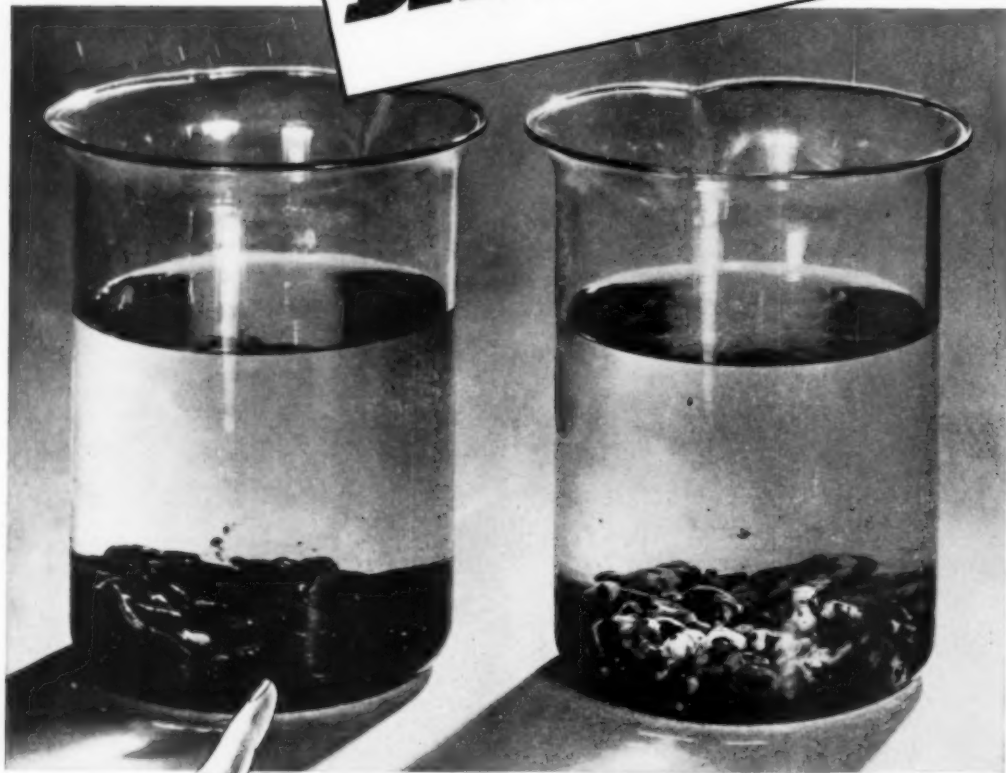
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Chart for Proper Asphalt Mixing Temperature
Little City with Big Street Paving Program
Another Look at Specifications (Page 80)
Texas Engineers Further Analyze Surface Treatment (P. 82)

AUGUST, 1952

*Here's
how*

DARAKOTE



Makes Asphalt Stick to the Aggregate

These unretouched photos show why DARAKOTE anti-stripping additive is making friends with highway engineers, contractors and community officials from coast to coast. Left photo contains aggregate coated with DARAKOTE—treated asphalt and immersed in water. Note 97-98 percent retention.

Right photo shows almost complete stripping of the untreated asphalt from the aggregate particles.

WRITE FOR COLORFUL, FACTUAL BROCHURE TODAY

...helps make paving dollars go further!

DARAKOTE is the anti-stripping additive for all types of bituminous mixtures and aggregates. Added to the asphalt mix, DARAKOTE actually displaces water on wet aggregates. It permits use of even hard-to-coat local aggregates. It *prevents* stripping both during and after construction. It extends the service life and durability of the pavement.

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Penetrating type, high silicone content water repellent for waterproofing exterior masonry above grade. Actually repels water. Clear, colorless, leaves no film, dries quickly.

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Send today for factual data

Order in drums
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Yes, small road builders, public and private alike, can now profit from the most practical method of soil stabilization ever developed.

This new, smaller P&H Stabilizer — the Model EA-56 — processes in 5-foot strips — making it ideal for street, highway, alley, airport and other kinds of jobs. It performs with all the economy and quality control of the larger P&H Stabilizers — processing native soils or aggregates with any type of admixture into a fine, lasting base of uniform and predetermined strength. The P&H machine is for granular, bituminous and cement soil stabilization work.

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The International L-160 series offers GVW ratings from 14,000 to 16,500 lbs., a wide variety of specialized bodies.

You can use **Komac*** Premix in any weather



*Koppers Trademark

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KOMAC Binders, offered exclusively by Koppers, mix easily and quickly with local aggregate. Since KOMAC Premix stays workable in the stockpile for a year or more, it is immediately available for use when you need it most. Send for free booklet. It will be helpful in setting up an all-weather repair and construction program.



KOMAC is still intact, while other patch mixes in foreground have been displaced and worn away. KOMAC is uniform and skid resistant, yet "tight".

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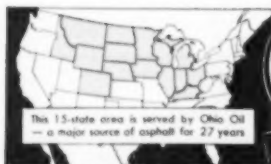


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Proper Asphalt Mixing Temperature?

This chart, based on known penetration and specific gravity, gives a good rough check

By H. E. Nevitt

Manager Asphalt Department, Central Region, Socony-Vacuum Oil Co., Inc., Kansas City, Mo.

THE proper temperature of mixing aggregate and asphalt in a hot-mix paving plant is one corresponding to an asphalt viscosity of 150 seconds Saybolt Furol. This recommendation was made in an article in *ROADS AND STREETS*, April, 1952, p. 96-97.

While this recommendation has met with generally favorable response, the problem of actually determining this temperature has occasionally caused trouble. It really ought not, as the asphalt supplier should have the proper laboratory facilities and personnel for making the determination. But times seem to arise when the temperature reading is not obtainable or only with difficulty. The penetration is, however, always known, and usually the specific gravity since this is a common test. These tests approximately set the correct mixing viscosity for typical asphalts—although the approximation is none too good; actual laboratory data should always be reported to, if this is in any way possible. These criteria are therefore made the basis of the attached chart for a field estimation of this temperature, or as a reference in case it is believed the temperature given is greatly in error. Its use is self-evident.

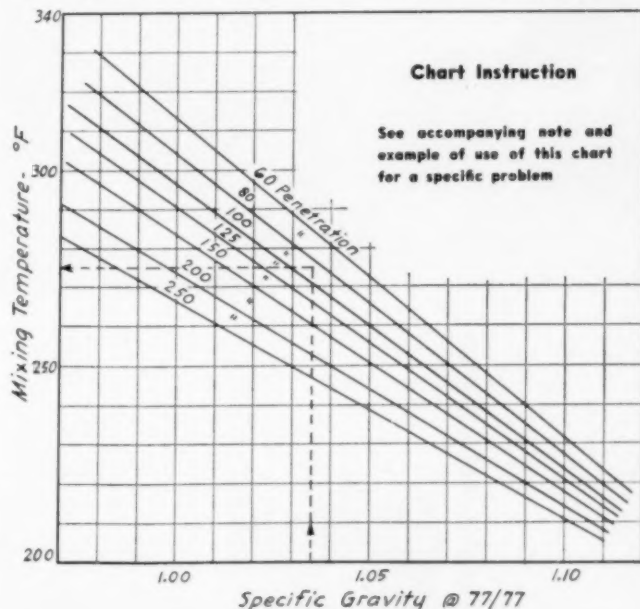
In case the specific gravity is not known, it can be easily determined in the field to the degree of accuracy justified in the use of this chart. As defined, it is the ratio of the weight of a given volume of asphalt to that of the same volume of water when both are at a temperature of 77° F. For the above purpose, a pail of water can be weighed, then the pail emptied and dried, and exactly the same volume of asphalt weighed in it likewise, care being taken that both the water and asphalt are weighed at the same temperature (presumably that of the surroundings, and not too variable). With the pail weight found previous to those weighings and deducted from the above weights, this ratio can be determined and used in the chart.

It is again emphasized that this chart does not give accurate results

(especially so with a few uncommon asphalts), and the actual temperature of the asphalt corresponding to 150 viscosity should be found and used. It may, however, be of some aid in certain cases, as a check on questionable recommendations, and to illustrate the considerable effect of both penetration and asphalt type on this correct mixing temperature.

NOTE: An approximation of the correct mixing temperature (that is, the temperature of the finished mix as discharged from the pug mill) for typical paving asphalts can be determined from this chart if the asphalt penetration and specific gravity (77/77) are known. The correct mixing temperature is defined as that at which the asphalt has a Saybolt Furol viscosity of 150 seconds, as discussed in the accompanying article. If this temperature can be determined by actual test or from the producer, such value should be used, as the chart only gives a very approximate value and provides no tolerance for plant deviations from the desired operating temperature.

EXAMPLE: An asphalt is reported



★ Approximate mixing temperature for paving asphalt

as 87 penetration, 1.035 specific gravity. The approximately correct mixing temperature as read from the chart is 275°F.

Soil Survey Mapping

Bulletin No. 46, Highway Research Board. This bulletin includes five related papers sponsored by the Board's Committee on Surveying and Classifying Soils In-Place for Engineering Purposes and presented at the 30th Annual Meeting of the Board in 1951. In addition to these papers on airphoto interpretation of engineering and geological features of terrain, the bulletin contains information compiled from the U. S. Geologic Survey, U. S. Department of Agriculture (Division of Soil Survey) and the Soil Conservation Service. Lists of geologists and soil scientists and current geologic and agricultural survey mapping in progress are included for reference.

A descriptive folder issued by the U. S. Geological Survey on topographic maps is included. Price \$1.50 per copy. Address request to the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C.

Little City with Big Paving Program

How McAllen, Texas, with 20,000 population, paved 40 miles of streets in a single year's time through a bond program.

By Jas. V. Curnutte

Consulting Engineer, San Antonio, Texas

FROM time to time ROADS AND STREETS has published accounts of ambitious street improvements by small communities. Adding to this series, the following account describes a street program which is probably the largest ever undertaken for a small Texas city.

McAllen with population of 20,000 is one of the principal cities of the rich Lower Rio Grande Valley. With the Valley's prosperity from citrus and other crops has come rapid population growth, McAllen gaining 70% in a decade and rapidly expanding its corporate area. The new areas taken in have had poor if any street paving, and the streets throughout the town have long been in need of general improvement.

The city commission saw need for adequate paving and also for setting up a means of insuring good paving in acreage subdivided in the future. It had a preliminary study made of needs for the entire city, with estimates developed for rehabilitating and widening older streets as well as for paving new unpaved streets. The job was estimated to cost \$1,500,000 and a financing program was adopted calling for the city to pay one-third and the property owners the remainder through assessments.

Accordingly a bond election was called in June of 1950 and a \$500,000 bond issue was voted by a large majority. Field surveys were begun immediately, along with preparation of plans and specifications. Bids were taken in February, 1951, and found to be slightly in excess of the estimate, since the work bid on took in greater

city area than originally contemplated.

\$1,500,000 Voted

This fact, together with the occurrence of unfavorable weather affecting the economic condition of lower income people in McAllen, made the city commission members feel doubtful that a full program could be completed under the property assessment policy. These facts having been placed before the citizenship, it was decided to consider financing the entire job through bonds, without recourse to assessments. A bond election was called in April, 1951, and a \$1,500,000 issue carried. Specifications and plans were then revised to fit the changed conditions, and a satisfactory construction bid obtained. E. B. Darby Company of Pharr, Texas, the successful bidder, began work June 15, 1951.

The pavement design consisted of three typical sections, namely:

Section 1: Where no pavement existed the completed pavement to consist of 6-in. compacted caliche or gravel base and 135 lb. per sq. yd. of hot mix asphaltic concrete.

Section 2: Widening of old pavement consisting of 6-in. compacted flexible base and placing 135 lb. per sq. yd. of hot mix asphaltic concrete over the old and new base sections.

Section 3: Where the old street is to be scarified, the existing base material compacted and 4 in. of additional compacted flexible base added followed with the 135 lb. per sq. yd. of hot mix asphaltic concrete.

An alternate bid was taken using 110 lb. per sq. yd. of hot mix asphaltic concrete in lieu of the 135 lb. Sub-grade conditions were generally good, and an exceptionally high quality of base material was available. Due to these circumstances and the large street mileage needing attention, the alternate bid was used in construction.

A rolled type curb and gutter with 20 in. total width was used, allowing 10 in. gutter width. Due to the very flat terrain the curb exposure was made 4 in. high, so as to gain all the advantage possible for sufficient gradients on the curb and gutter and still not trap water on adjacent properties.

The unit bid prices including con-

★ Plant and finishing operations of Heldenfels Bros. on McAllen's street paving. The paving crew is seen working through an industrial area

struction cost plus the engineering fee were as follows:

Typical Section 1: \$1.51 per sq. yd. for completed pavement which included excavation, base and asphalt surface.

Typical Section 2: \$0.86 per sq. yd. for the new base section and \$0.65 per square yard for surface course.

Typical Section 3: \$1.31 pe sq. yd. for salvaged and reconstructed base and surface course.

All the above being for square yard price of completed work for the typical sections involved. The curb and gutter was \$1.07 per lin. ft. in place.

Resurface Problem

During construction quite a bit of Section 2 was converted to Section 3, as it was difficult to get a uniform crown in tying into the old pavement sections. It was found to be substantially as economical as using the widened base section and resurfacing, since additional tonnage of asphalt had to be used in many instances to secure proper cross sections. It is the opinion of the engineer that better results would have been obtained with very little additional cost had the design been originally planned to scarify and reshape all existing pavement as specified under Section 3.

E. B. Darby and Company sub-contracted with Heldenfels Bros., Corpus Christi, for hot mix asphaltic concrete. A 100-ton-per-hour Cedar-rap plant and a Barber-Greene finisher were used with average daily production of 530 tons. One three wheel, one tandem and two pneumatic rollers were used on the surface course. Caliche for aggregate was furnished from the contractor's own pit about a six mile haul from the city limits and was crushed to a size 100% passing the 2-in. round screen.

The final quantities for the job were about 548,000 sq. yd. of completed new pavement, 91,000 sq. yd. of salvaged and reconstructed pavement, 92,000 sq. yd. of widened and resurfaced pavement and 430,000 lin. ft. of curb and gutter at a total cost of \$1,615,000. This sum includes approximately \$50,000 for extension of storm sewers and other drainage facilities. Other incidental costs consisted of about \$15,000, making the total construction about \$1,630,000 or about \$130,000 over the original estimate.

Additional funds over the bond issue were secured from very careful management in securing interest payments for time deposits on the bond funds, and through special city revenues derived from the sale of natural gas to a gas production company.



★ Typical newly-paved street in sub-tropical McAllen, whose citizens voted bonds for a city-wide job of sprucing up the streets

Less than 5% of McAllen's existing streets are yet to be paved, and there is a small amount of old pavement that will require a surface treatment within two or three years. It is anticipated that gas sales of \$96,000 a year will be used to reduce the tax rate in outstanding bonds, provide for a yearly budget to cover construction of all remaining streets and provide for the resurfacing mentioned as well as maintenance costs.

A new city ordinance requires that when new subdivisions are developed, the owner and/or developer will either pave the streets to the City's standard specifications or place monies in escrow for the city to perform this work or contract for it, before any subdivision plat will be approved and utilities furnished. This plan has been in operation for the past several months and is working well.

(Continued on page 81)

TRINITY TESTING LABORATORIES, INC.

CORPUS CHRISTI, TEXAS

FIELD LABORATORY FOR ASPHALTIC CONCRETE

Project City of McAllen - Streets Control Date May 31, 1952
Location of Plant McAllen Type of Plant Batch Contractor Heldenfels
Specs. Item 317 Type HP

COMBINED BIN ANALYSIS

| Size | Bin No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | EXTRACTIONS |
|-----------------|---------|------|------|------|---|---|---|---|---|-------------|
| 1 1/2" - 2 1/2" | | 0.0 | 0.0 | 0.0 | | | | | | 0.0 |
| 1 1/2" - 1 1/4" | | 0.7 | 0.7 | 0.9 | | | | | | 0.7 |
| 1 1/4" - 1 1/2" | | 30.0 | 30.0 | 30.0 | | | | | | 28.8 |
| 1 1/2" - 1 1/4" | | 28.7 | 27.3 | 29.5 | | | | | | 26.8 |
| +10 | | 57.4 | 58.0 | 60.4 | | | | | | 56.3 |
| 10 - 40 | | 6.9 | 6.8 | 6.5 | | | | | | 6.0 |
| 40 - 80 | | 17.7 | 15.7 | 17.3 | | | | | | 16.3 |
| 80 - 200 | | 10.5 | 11.3 | 10.3 | | | | | | 10.4 |
| Pass 200 | | 5.5 | 5.2 | 5.5 | | | | | | 5.4 |
| Asphalt | | | | | | | | | | 5.4 |
| Total | | | | | | | | | | |

| Time | Bin No. | Lot | Lot | Lot | Lot | Lot | Lot | Lot | Lot |
|------|---------|----------|-----|------|-----|-----|-----|-----|-----|
| 1 | 9.00 | Unit 133 | 320 | 95.3 | 62 | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |

| Course | Station to Station | Lot | Sq. Yd. | Yds. |
|--------|--------------------|-----|---------|------|
| Surf. | Unit 133 | | 4959.1 | 276 |
| " | Unit 133A | | 513.4 | 30 |
| " | Unit 133B | | 511.7 | 31 |
| " | Unit 166 | | 4562.4 | 280 |
| " | Unit 170 | | 214.5 | 13 |

Aggregate Used 595,980 Tons

Asphalt Used 24,020 Tons

★ Typical test report, showing excellent control of hot mix asphaltic concrete production

SUMMARY

Sq. Yd. Total Tons New Old
Proc. Report 625,601.3 36,000 25,244 10,756
This Report 10,791.1 630 219 311
To Date 636,392.4 36,630 25,463 11,067
Avg. Rate to Date 115.2# All Sq. yd.
% Complete 81.7%

Source of Aggregate Size Bulk Sp. Gr.

Same as previously reported

Asphalt 68-90
Type
Producer Texas Co.
Sp. Gr. (79° F.) 1.020
Weather Fair
Min. Temp.
Max. Temp.
W. C. Skipworth
Inspector No. 70

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BULK HANDLING "Set-Up"


This 4-ton traveling crane of well known high quality expends its energy and efficiency through this 3-ton capacity.

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Clay discharged into the craneway is water treated by fog-nozzles to reduce dust and increase water content to aid in aging.

The 15,000-ton capacity warehouse 840' x 50' is serviced by two cranes and two buckets. Only two men are required to move the clay, combine the mix and feed the bins for the dry pan.

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You Can't Do That

(An Editorial)

"You can't do that," was the reply in a famous comedy dialogue to the comment that the doctor had ordered him to take one pill three times a day. Whether or not this is good humor, it certainly applies to some specification requirements.

As was pointed out in last month's editorial, limiting controls through specifications is both desirable and essential despite the engineer's need for freedom to utilize his judgment in evaluating intangibles so as to get the best results possible. Regardless of the merits of specifications from this standpoint—that is, what they are trying to accomplish—they must likewise be realistic in the controls set up. Specifications occasionally appear which cannot be met in practical operation, meaning either trouble to the contractor and likewise the inspector, or tacit agreement between the two to ignore them, which in the end will probably defeat their purpose. There have been bituminous specifications put out on which the nominal deviations to be expected in laboratory results were greater than the permissible range allowed by the specifications. There was even one case of a bituminous specification issued by a large governmental organization which called for a cutback with a volatile constituent and at the same time a flash higher than that normally specified for paving asphalts required to have no volatiles at relatively high temperatures. We wonder how many specifications today are viewed from the standpoint of the practical tolerances needed in the work as compared to the limits set.

These remarks on specifications are not intended as a criticism of the usual requirements in this field, but rather as the background of a plea for more critical analysis of the work done under existing specifications. Many states have the practice of recording and analyzing the results from their jobs, both to show the degree with which the specifications were met and to tabulate the critical characteristics which indicate the quality of the finished projects. A typical instance might be Report No. 10 issued last year by the Minnesota Highway Department on its 1950 bituminous program. Such studies

are extremely advantageous in making specifications realistic and helpful.*

Increased data of this type, with wide dissemination to all concerned and the indicated action taken, will lead to more effective specifications, practical requirements, and balance in the demands on the contractor—in brief, to the far better quality of bituminous work possible at negligible extra cost from our rapidly increasing knowledge of asphalt design and construction.

*The substance of this report is given in article "Qualitative Review of Minnesota's 1950 State Highway Bituminous Program"; Roads and Streets, September, 1951.

Little City With Big Paving Program

(Continued from page 79)

Ready-mix concrete for curb and gutter and structures in the afore-described program was furnished by the Valley Ready Mix Concrete Company of McAllen. The aggregate for the hot mix asphaltic concrete was furnished by the Fordyce Gravel Company from their plant at Sullivan City and the OA-90 Asphalt and RC-2 Prime was furnished by the Texas Company from their plant at Port Neches. The Trinity Testing Laboratory of San Antonio was responsible for the batch control and all testing on the job.

McAllen's policy making body consists of the mayor and four commissioners operating under a Home Rule Charter, and they have given consistent backing to the city manager and the project engineer. The financial arrangements were handled by Wm. L. Schupp, city manager. Plans, specifications and supervision of construction was under the direction of the writer.

Manufacturers' News

Stewart Armington Elected Euclid Chairman. Directors of the Euclid Road Machinery Co., Cleveland, O., on Tuesday, June 3, elected Stewart F. Armington chairman of the board. He succeeds his father, G. A. Armington, who was elected honorary chairman after serving as board chairman ever since the company was formally incorporated in 1931. Stewart Armington, one of the founders of the company, steps up to the chairmanship from vice president. G. E. Armington succeeds Stewart Armington as vice president, engineering, and Hugh T. Monson was elected vice president, manufacturing. E. H. Newby was elected vice president, controller. He has been with Euclid 16 years and has served as advertising manager and personnel director.



Preferred power on industrial power sweepers — the world's most widely used single-cylinder gasoline engines on hundreds of kinds and types of machines, tools, appliances used by industry, construction, railroads, oil-fields, and on equipment for farms and farm homes.

Time-tested, compact, powerful, reliable — Briggs & Stratton single-cylinder, 4-cycle, air-cooled gasoline engines are made by the world's largest builder of engines, and backed by the world's largest service organization of its kind. Briggs & Stratton Corporation, Milwaukee 1, Wisconsin, U.S.A.

In the automotive field Briggs & Stratton is the recognized leader and world's largest producer of locks, keys and related equipment.

THOUGHTS AND THEORIES ON

Penetration Surfaces

This analysis and discussion is based on Texas experience, which covers a wide range of climatic and traffic conditions. Presented at the 26th Annual Highway Short Course, Texas A & M College, College Station, Texas, March 6, 1952.

By Jerome P. Kearby

Senior Resident Engineer, Texas Highway Department, District 2 (Fort Worth), Decatur, Texas

WE feel that we are in need of design procedures for Asphalt Surface Treatments, which have the advantages of simplicity and uniformity by which the required amounts of asphalt and aggregate may be determined, by test methods, rather than left entirely to visual approximation and judgment.

In recent years, and at the present time, we are hearing much about the hazards and damage caused the traveling public due to flying stones, dust, and slick asphalt surfaces. We have endeavored to reduce these conditions in every way possible. It has been observed that in using the coarsest grades of aggregate of nearly uniform size, with a spread ratio just sufficient to slightly more than cover the surface one stone in depth—and by limiting the asphalt to an amount sufficient to embed only a portion of the thickness of the loose mat of aggregate—we have most nearly approached the desired results.

Too Much Leaway

We have observed that the specification requirements for gradations of aggregates are very broad, permitting coarse graded aggregates, fine graded aggregates, and aggregates graded fine to coarse, to be furnished within the limits of each grade. These aggregates when carefully analyzed, vary considerably in particle sizes and shapes, as well as percent of voids.

It is apparent that the particle sizes and shape of aggregates control the amount of a particular aggregate needed as sufficient cover material; and that the amount of asphalt required is controlled by the sizes and shape of particles and percent of voids in the aggregate, as well as the conditions of the base or surface which is to receive the application.

The term "surface treatment" is ordinarily used to describe the application of an asphaltic binder with a cover coat of mineral aggregate to produce an asphaltic mat of appreciable thickness on a prepared base. The thickness of a one-course surface mat is ordinarily controlled by the average size of aggregate particles in the cover coat. Sometimes, multiple surface treatments consisting of two or more applications are constructed to increase the density of the surface.

A surface treatment called the seal coat is frequently applied to an existing surface to make the surface waterproof or non-skid. Seal coats are most frequently used to replace or rejuvenate old, dried and worn out bituminous surfaces and/or to provide non-skid characteristics on old, slick asphalt surfaces.

This paper is devoted primarily to a recommended practice in determining the amounts of asphalt and aggregate required in the construction of one-course asphalt surface treatments, and seal coats.

The succeeding suggestions for asphalt surface treatments and seal coats are recommended for use under what may be termed general and average conditions. It is realized, however, that no single standard procedure will cover satisfactorily all variations in local conditions, which may prevail for individual jobs.

The quantity of aggregate and asphalt required for a given area varies according to the character of the aggregate, being influenced by the unit weight, percent of voids, shape and size of the particles. Thus, as a rule, somewhat less weights of slag and certain gravels are required for a given amount of asphaltic material, as compared with most grades of broken stone. The engineer should modify the amount according to local conditions. For surface treatments it is always better to err on the side of a slight deficiency of asphalt so as to avoid a

fat, slick surface. Our first thought should be to avoid the hazard of flying rock particles, and the danger of fat, slick surfaces.

It is our opinion that the aggregate in an asphaltic surface treatment should be sufficiently embedded in the asphalt to resist displacement, but the asphalt should not be so close to the surface after compaction as to permit tires to reach and spread it.

Better Procedure Sought

During the past several years, much time and thought has been devoted to the construction of satisfactory asphalt treated surfaces. Much valuable information has been derived from these experiments and studies, but heretofore we have known of no standard and reliable set of procedures by which the quantities of asphalt and aggregate can be predetermined. With this in mind, we have endeavored to devise a set of procedures which will reasonably assure economical asphaltic treated surfaces with the following characteristics: a smooth-riding, non-skid, waterproof surface of uniform texture and color, which during construction will minimize dust and flying rock particles.

In devising such procedures, the quantity of aggregate should be that amount required to form a blanket one stone in depth. That is, each stone covers some portion of the area; therefore, aggregate quantity is definitely determined by its unit weight and the shape and size of aggregate particles. Also, the quantity of asphalt is dependent upon the percentage of voids in the aggregate; the desired depth of aggregate to be embedded in the asphalt, and to some extent, the type of surface or base on which the treatment is to be placed, as well as the hardness of the cover stone, and the type, kind and amount of traffic.

The following are the main factors involved in predetermining the amount of aggregate and asphalt required for satisfactory surface treatments:

First: The amount of a given aggregate required to cover one square yard in area, which we have termed the "Effective Mat Thickness," or average thickness of the aggregate when placed so as to form a blanket of aggregate one stone in depth. (See Figure I.)

Second: The amount of asphalt per square yard of surface that will be required to embed a desired portion of the "Effective Mat Thickness" of the aggregate. (See Figure II.)

In determining the aggregate factors, the unit weight, specific gravity, voidage and screen analysis of the aggregate were determined.

Sample Problem

The effective mat thickness is dependent upon the screen analysis of the material being used; hence we set up the following sample procedures to compute each of the above factors for a sample of Grade 1 aggregate, Item 351 of the Texas Highway Department Specifications.

From an individual screen analysis of the aggregate, a middle specification gradation was obtained, assuming the rock size to be average between the passing and retaining screen sizes. (See Figure I.)

Using the middle gradation, the effective mat thickness of the rock blanket was computed as indicated on Figure I.

Figure I is a breakdown of Grade 1 aggregate, using a sample that fits the middle of the gradation requirements. Note that the specification gradation has been repropportioned to obtain an accumulative average gradation, showing the percent retained on each screen size within the specification limits, and we have indicated the average individual screen analysis, the size of each being that which is half way between the passing and retaining screen sizes. The average particle size or effective mat thickness is determined by multiplying each individual screen size by its percentage, and then obtaining the sum of the products. The theoretical spread ratio equals 1 yd., or 36 in., divided by the effective mat thickness; the quotient being the number of square yards spread for each cubic yard of material. This method of determining average aggregate particle sizes, theoretical mat thickness and spread ratio for a cover of one stone average thickness, can be satisfactorily used if flat and elongated aggregate particles are not present.

When flat or elongated aggregate particles are present, the screen analysis method of determining average particle size, effective mat thickness, and spread ratio cannot be depended upon, as the flat and elongated particles will tend to lie on a flat side and thereby reduce the effective mat thickness, cover a greater area, displace other particles, and consequently increase the spread ratio.

For most aggregates, and especially for aggregates containing flat and

| Sizes | 1" | 7/8" | 3/4" | 5/8" | 1/2" | 3/8" | 1/4" | #10 | #20 | Percent Passing | #10 | #20 |
|--------------------------------------|---------|-----------|-----------|-----------|-----------|-----------|----------|-------|-----|-----------------|-----|-----|
| Specification accumulative gradation | | | | | | | | | | | | |
| Percent | | | | | | | | | | 0/3 | 0/3 | |
| Average accumulative gradation | | | | | | | | | | | | |
| Percent | 0 | 15 | 30 | 61 | 92.5 | 95 | 97.5 | 98.5 | 99 | 15 | 1 | |
| Average Individual Screen Analysis | | | | | | | | | | | | |
| Sizes | 7/8"-1" | 3/4"-7/8" | 5/8"-3/4" | 1/2"-5/8" | 3/8"-1/2" | 1/4"-3/8" | #10-1/4" | #20 | | | | |
| Avg Sizes | 15/16" | 13/16" | 11/16" | 5/8" | 7/16" | 5/16" | 3/16" | 1/16" | | | | |
| Percent | 15 | 15 | 31 | 31.5 | 2.5 | 2.5 | 15 | 10 | | | | |

Calculations for Average Particle Sizes of Aggregate And Effective Mat Thickness

| Percent Times Average Size |
|-----------------------------------|
| 15% x 15/16" = 2.250/16" |
| 15% x 13/16" = 1.950/16" |
| 31% x 11/16" = 3.410/16" |
| 31.5% x 5/8" = 2.035/16" |
| 2.5% x 7/16" = 0.175/16" |
| 2.5% x 3/16" = 0.125/16" |
| 15% x 3/16" = 0.045/16" |
| 10% x 1/16" = 0.010/16" |
| 100% Total = 10.000/16" = 432/64" |

The average size of Aggregate particles being 432/64"
The Theoretical Mat thickness for one stone cover = 432/64"
The Theoretical Spread Ratio = 36 divided by 432/64" = 1.53
or 1 cu yd of Aggregate for each 53 Sq Yds. surface

★ Figure I—Method used in computing average aggregate sizes using Grade 1 aggregate

elongated articles, the square yard test board should be used to determine the average particle depth, effective mat thickness and spread ratio, the procedure being as follows:

Obtain a one square yard test board. Place a sufficient quantity of the aggregate on the board to obtain a full coverage one stone in depth. Weigh the aggregate required for the one stone depth coverage. Then, the pounds per cubic yard divided by the pounds per square yard equals the spread ratio in square yards per cubic yard. The average particle depth and effective mat thickness is obtained by dividing 36 inches by the number of square yards covered per cubic yard.

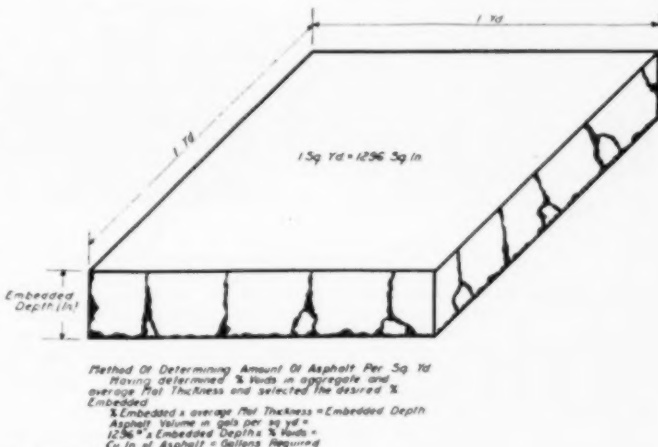
Figure II is a graph showing the displacement of asphalt due to the embedding of aggregate. The method used to determine the amount of as-

phalt required is dependent upon the percent of the average rock mat thickness to be embedded in asphalt, and the percent of voids in the aggregate.

The desired percentage embedded times the average rock mat thickness equals the embedded depth.

1 sq. yd., or 1296 sq. in., times the desired embedded depth, times the percent of voids in aggregate equals volume of asphalt required per square yard, based on the hard grade of oil asphalts containing approximately 99% bitumen.

This calculation is not precise, in that the percent of voids in the embedded portion of the aggregate mat is not necessarily the same as in the aggregate sample. The percent of voids in the embedded portion can be determined by laboratory tests; however, we have observed that in using the percent of voids in the aggregate



★ Figure II

**Figure III—Texas Highway Department Specification Item 351
Aggregate for Surface Treatments**

Variations in Gradation Permitted Under Specifications Divided into Three Categories: Coarse, Middle and Fine Grade

| Aggregate Grade | Percent Retained on Screen Sizes | | | | | | | | Percent Passing | | Approximate | | Average Voids 35 Percent | | | |
|----------------------|----------------------------------|------|------|------|-------|------|-------|------|-----------------|-----|-------------|-----------------|--------------------------|------------------------------|-----------------------------------|---|
| | 1" | 3/4" | 3/8" | 1/4" | 3/16" | 1/8" | 1/16" | #10 | #20 | #10 | #20 | Avg Size Inches | Spread Ratio CY/SY | Recommended Percent Embedded | Required Asphalt-Gal. per Sq. Yd. | |
| No. 1—Specification | 0 | — | 15 | — | 85 | — | 95 | 97 | 97 | 0 | 0 | — | — | — | — | |
| | | | 45 | | 100 | | 100 | 100 | 100 | 3 | 3 | | | | | |
| No. 1—Coarse Grade | 0 | 45 | 45 | 100 | 100 | 100 | 100 | 100 | 100 | 0 | 0 | 51.64 | 1.45 | 4 | 0.59 | |
| No. 1—Middle Grade | 0 | 15 | 30 | 61 | 92.5 | 95 | 97.5 | 98.5 | 99 | 1.5 | 1 | 43.64 | 1.53 | 40 | 0.53 | |
| No. 1—Fine Grade | 0 | 0 | 15 | 15 | 85 | 85 | 95 | 97 | 97 | 3 | 3 | 35.64 | 1.65 | 36 | 0.39 | |
| No. 2—Specification | 0 | 0 | 0 | — | 30 | — | 80 | 97 | 97 | 0 | 0 | — | — | — | — | |
| | | | | | 70 | | 100 | 100 | 100 | 3 | 3 | | | | | |
| No. 2—Coarse Grade | 0 | 0 | 0 | 70 | 70 | 100 | 100 | 100 | 100 | 0 | 0 | 39.64 | 1.59 | 38 | 0.45 | |
| No. 2—Middle Grade | 0 | 0 | 0 | 25 | 50 | 70 | 90 | 98.5 | 99 | 1.5 | 1 | 31.64 | 1.75 | 34 | 0.31 | |
| No. 2—Fine Grade | 0 | 0 | 0 | 0 | 30 | 30 | 80 | 97 | 97 | 3 | 3 | 23.64 | 1.100 | 31 | 0.22 | |
| No. 3—Specification | 0 | 0 | 0 | — | 25 | — | — | 97 | 97 | 0 | 0 | — | — | — | — | |
| | | | | | 50 | | | 100 | 100 | 3 | 3 | | | | | |
| No. 3—Coarse Grade | 0 | 0 | 0 | 50 | 50 | 100 | 100 | 100 | 100 | 0 | 0 | 9.16 | 1.64 | 36 | 0.40 | |
| No. 3—Middle Grade | 0 | 0 | 0 | 19 | 37.5 | 58 | 78 | 98.5 | 99 | 1.5 | 1 | 27.64 | 1.84 | 32 | 0.27 | |
| No. 3—Fine Grade | 0 | 0 | 0 | 0 | 25 | 25 | 25 | 97 | 97 | 3 | 3 | 9.32 | 1.130 | 27 | 0.15 | |
| No. 4—Specification | 0 | 0 | 0 | — | 5 | — | — | 97 | 97 | 0 | 0 | — | — | — | — | |
| | | | | | 20 | | | 100 | 100 | 3 | 3 | | | | | |
| No. 4—Coarse Grade | 0 | 0 | 0 | 20 | 20 | 100 | 100 | 100 | 100 | 0 | 0 | 31.64 | 1.74 | 34 | 0.31 | |
| No. 4—Middle Grade | 0 | 0 | 0 | 0 | 12.5 | 41.5 | 69.5 | 98.5 | 99 | 1.5 | 1 | 11.32 | 1.104 | 30 | 0.20 | |
| No. 4—Fine Grade | 0 | 0 | 0 | 0 | 5 | 5 | 5 | 97 | 97 | 3 | 3 | 13.64 | 1.178 | 24 | 0.09 | |
| No. 5—Specification | 0 | 0 | 0 | 0 | 0 | — | 60 | 97 | 97 | 0 | 0 | — | — | — | — | |
| | | | | | 10 | | 100 | 100 | 100 | 3 | 3 | | | | | |
| No. 5—Coarse Grade | 0 | 0 | 0 | 0 | 10 | 100 | 100 | 100 | 100 | 0 | 0 | 29.64 | 1.80 | 33 | 0.30 | |
| No. 5—Middle Grade | 0 | 0 | 0 | 0 | 5 | 42.5 | 80 | 98.5 | 99 | 1.5 | 1 | 11.32 | 1.104 | 30 | 0.20 | |
| No. 5—Fine Grade | 0 | 0 | 0 | 0 | 0 | 0 | 60 | 97 | 97 | 3 | 3 | 17.64 | 1.139 | 26 | 0.13 | |
| No. 6—Specification | 0 | 0 | 0 | 0 | 0 | — | 35 | 97 | 97 | 0 | 0 | — | — | — | — | |
| | | | | | 10 | | 60 | 100 | 100 | 3 | 3 | | | | | |
| No. 6—Coarse Grade | 0 | 0 | 0 | 0 | 10 | 60 | 60 | 100 | 100 | 0 | 0 | 11.32 | 1.103 | 30 | 0.20 | |
| No. 6—Middle Grade | 0 | 0 | 0 | 0 | 5 | 26 | 47.5 | 98.5 | 99 | 1.5 | 1 | 9.32 | 1.127 | 27 | 0.16 | |
| No. 6—Fine Grade | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 97 | 97 | 3 | 3 | 15.64 | 1.158 | 26 | 0.11 | |
| No. 7—Specification | 0 | 0 | 0 | 0 | 0 | 5 | — | 97 | 97 | 0 | 0 | — | — | — | — | |
| | | | | | | 20 | | 100 | 100 | 3 | 3 | | | | | |
| No. 7—Coarse Grade | 0 | 0 | 0 | 0 | 0 | 20 | 100 | 100 | 100 | 0 | 0 | 11.32 | 1.107 | 29 | 0.19 | |
| No. 7—Middle Grade | 0 | 0 | 0 | 0 | 0 | 12.5 | 55.5 | 98.5 | 99 | 1.5 | 1 | 17.64 | 1.133 | 27 | 0.14 | |
| No. 7—Fine Grade | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 97 | 97 | 3 | 3 | 13.64 | 1.183 | 24 | 0.09 | |
| No. 8—Specification | 0 | 0 | 0 | 0 | 0 | 0 | — | 97 | 97 | 0 | 0 | — | — | — | — | |
| | | | | | | 10 | | 100 | 100 | 3 | 3 | | | | | |
| No. 8—Coarse Grade | 0 | 0 | 0 | 0 | 0 | 10 | 100 | 100 | 100 | 0 | 0 | 21.64 | 1.108 | 29 | 0.19 | |
| No. 8—Middle Grade | 0 | 0 | 0 | 0 | 0 | 5 | 52 | 98.5 | 99 | 1.5 | 1 | 1.4 | 1.140 | 26 | 0.13 | |
| No. 8—Fine Grade | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 97 | 97 | 3 | 3 | 3.16 | 1.196 | 24 | 0.08 | |
| No. 9—Specification | 0 | 0 | 0 | 0 | 0 | 0 | — | 5 | 70 | 98 | 0 | 0 | — | — | — | — |
| | | | | | | | 35 | 100 | 100 | 30 | 2 | | | | | |
| No. 9—Coarse Grade | 0 | 0 | 0 | 0 | 0 | 35 | 35 | 100 | 100 | 0 | 0 | 9.32 | 1.131 | 27 | 0.15 | |
| No. 9—Middle Grade | 0 | 0 | 0 | 0 | 0 | 10 | 20 | 85 | 99 | 15 | 1 | 13.64 | 1.175 | 24 | 0.09 | |
| No. 9—Fine Grade | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 70 | 98 | 30 | 2 | 5.32 | 1.230 | 23 | 0.07 | |
| No. 10—Specification | 0 | 0 | 0 | 0 | 0 | 0 | — | 2 | 70 | 98 | 0 | 0 | — | — | — | — |
| | | | | | | | 20 | 100 | 100 | 30 | 2 | | | | | |
| No. 10—Coarse Grade | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 100 | 100 | 0 | 0 | 7.32 | 1.169 | 25 | 0.10 | |
| No. 10—Middle Grade | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 85 | 99 | 15 | 1 | 3.16 | 1.197 | 24 | 0.08 | |
| No. 10—Fine Grade | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 70 | 98 | 30 | 2 | 5.32 | 1.236 | 23 | 0.07 | |

sample as a factor in the design procedure, satisfactory results have been consistently obtained. If liquid asphalts containing volatiles or emulsion asphalts containing water are used, then the quantity should be increased proportionately to bitumen content.

Figure III is a table showing the

variations in gradation as permitted under the specification, divided into three categories: the coarsest grade, middle grade and finest grade possible under the specification. For each grade we have calculated average particle size and spread ratio, based on screen analysis. We have also indicated the bitumen required, based on average

voids of 35%, and our recommended percent of aggregate to be embedded. Note the probable variation in average size, spread ratio, and required asphalt for each grade within the specification limits, which is still greater when flat and elongated particles are present. Particularly note Grade 3 and Grade 4 aggregates which require certain



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MIXES ALL THE HOT PATCH YOU NEED,
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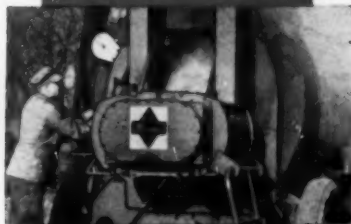
Now, the new Barber-Greene Mixall gives you the opportunity to offer high quality bituminous paving for driveways, sidewalks, service stations, industrial plants, parking lots . . . and other "black top" jobs at new low costs.

The Mixall, a completely new, compact and portable small-job maintenance and paving mixer, will produce up to 5 t.p.h. of any type hot mix . . . up to 10 t.p.h. of cold mix . . . will produce low slump Portland cement mixes. Built to be towed behind the aggregate truck for on-the-spot mixing, the Mixall is just as well suited for central plant or stock pile operation. The Mixall can work in any weather . . . even drying frozen aggregates.

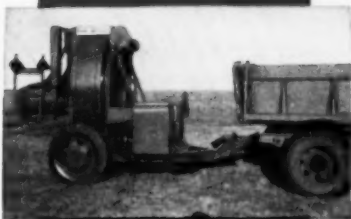
Think of what you could do with the new B-G Mixall in your territory. Then see the Mixall at your first opportunity . . . or write for full information.

THE ONLY SMALL JOB MAINTENANCE MIXER WITH...

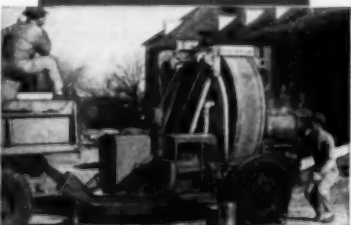
- **ROTARY DRUM DRYING:** The same principle used in largest B-G Continuous Dryers.
- **TWIN SHAFT HEATED PUGMILL:** "Kneading" action assures even coating of every aggregate particle.
- **POWER SKIP HOIST:** Only 14" high for easy charging.
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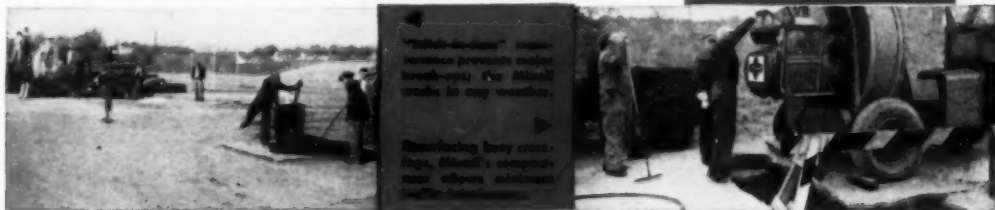
The parking lot, factory floors . . . on-the-job drying of aggregate . . . complete control of mix.



For playgrounds, tennis courts, roads and streets . . . concrete . . . variations of mixes.



In using time with Mixall, Operator is enabled to work for others, other jobs, other small jobs.



"Black-top" maintenance prevents major breakdowns for Mixall made in any weather. . . .

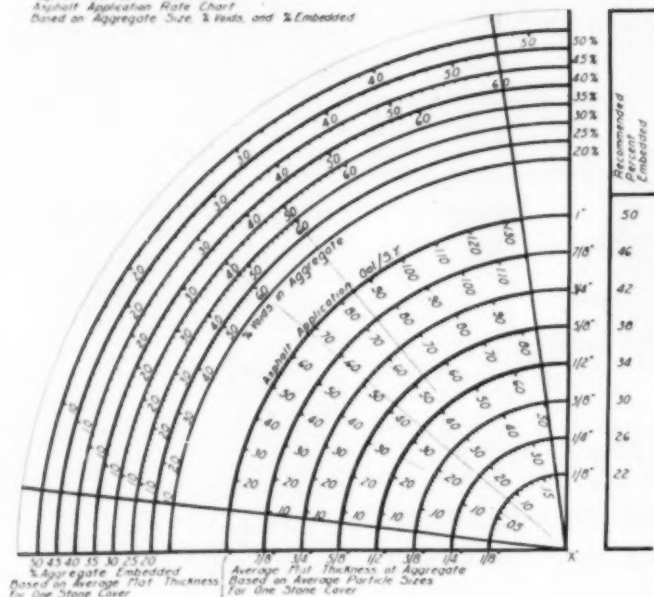
Manufacturing heavy concrete, Mixall's compactness allows minimum traffic interference.

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Asphalt Surface Treatments
Asphalt Application Rate Chart
Based on Aggregate Size, % Voids, and % Embedded



★ Figure IV—Estimating chart. Example: Assume average aggregate mat thickness $\frac{1}{2}$ in.; voids in aggregate 40%; desired embedment depth of aggregate 30%. Place straightedge through Point "X" and 40% void point on 30% Embedment Curve, and find Asphalt Application Rate to be 0.335 gal. per sq. yd. on $\frac{1}{2}$ in. Aggregate Curve

percentages retained on the $\frac{1}{2}$ in. screen and # 10 mesh sieve, with no requirements specified on the $\frac{3}{8}$ or $\frac{1}{4}$ in. screens, thereby allowing aggregates with gap gradations to be furnished.

The quantities indicated in Figure III may be used for estimating purposes in determining the estimated

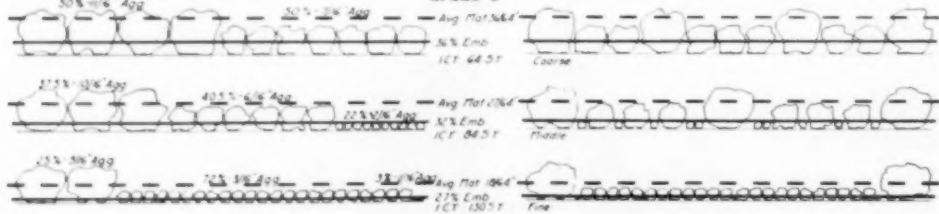
cubic yards of aggregate and gallons of asphalt required for desired grades of aggregate. However, the actual application of asphalt and aggregate will vary with the gradation, unit weight, and percent of voids in the aggregate delivered, and the desired embedded depth of aggregate.

Many engineers will disagree, at

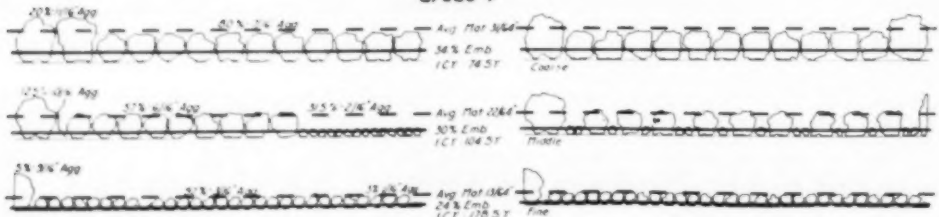
first reading, with the quantities shown in Figure III saying, "In our use of aggregates, Grades 1 through 10, we have used more or less asphalt, and more or less aggregate than shown in the table, and have obtained satisfactory results." This statement may be true, and it serves to illustrate our point that the rates of application of asphalt and aggregate are dependent upon the average size and shape of aggregate particles, percent of voids in aggregate and characteristics of the existing base or surface. Some of these engineers may have used a coarse-graded material which had a greater effective mat thickness, and greater percent of voids, and thereby allow a greater quantity of both asphalt and aggregate to be used. Likewise, a fine graded material will have a lesser effective mat thickness, and may have a smaller percent of voids, thereby allowing a lesser quantity of both asphalt and aggregate to be used.

Some engineers may also say, "We have used more aggregate and less asphalt than is shown in Figure III, which resulted in a bleeding or slickened surface." It has been our experience that a considerable excess of cover material is often more detrimental

Asphalt Surface Treatments Grade 3



Grade 4



★ Figure V—Aggregate specification gradation chart showing average size and recommended percent embedment; Texas grades 3 and 4

Figure VI—Item 351 and Special Recommended Grading of Aggregates for Asphalt Surface Treatments

By Jerome P. Kearby, Sr., Res. Engineer, Texas Highway Department

| | | | | | | | |
|-----------|--------------------|--------|---------|------------|------------------|--------|---------|
| Grade I | Retained on 1 1/2" | Screen | 0% | Grade V | Retained on 3/4" | Screen | 0% |
| | Retained on 1" | Screen | 40-60% | | Retained on 1/2" | Screen | 40-60% |
| | Retained on 3/4" | Screen | 95-100% | | Retained on 3/8" | Screen | 95-100% |
| Grade II | Retained on 1 1/2" | Screen | 0% | Grade VI | Retained on 3/4" | Screen | 0% |
| | Retained on 1" | Screen | 40-60% | | Retained on 1/2" | Screen | 40-60% |
| | Retained on 3/4" | Screen | 95-100% | | Retained on 3/8" | Screen | 95-100% |
| Grade III | Retained on 1 1/2" | Screen | 0% | Grade VII | Retained on 3/4" | Screen | 0% |
| | Retained on 1" | Screen | 40-60% | | Retained on 1/2" | Screen | 40-60% |
| | Retained on 3/4" | Screen | 95-100% | | Retained on #10 | Mesh | 95-100% |
| Grade IV | Retained on 1 1/2" | Screen | 0% | Grade VIII | Retained on 3/4" | Screen | 0% |
| | Retained on 1" | Screen | 40-60% | | Retained on #10 | Mesh | 40-60% |
| | Retained on 3/4" | Screen | 95-100% | | Retained on #20 | Mesh | 95-100% |

Average Spread Ratio for Simple Applications

| No. 1 | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 | No. 7 | No. 8 |
|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.36 | 1.41 | 1.48 | 1.58 | 1.72 | 1.96 | 1.144 | 1.288 |

tal than a slight shortage of cover material, in that with an excess of cover material the amount of fines applied is also increased. The excess of fines tends to go to the bottom and become embedded in the asphalt or blot the surface of the asphalt, thereby preventing the embedding of the coarse material and allowing a large percent of the coarser particles to be subject to whip-off, leaving a fat or flooded condition.

Fines Act as Filler

It is our opinion that the material passing the 10 mesh sieve acts as a filler in much the same manner as sand in a cement mortar, thereby raising the level of the asphalt, and cannot be counted on as cover material to furnish any riding surface.

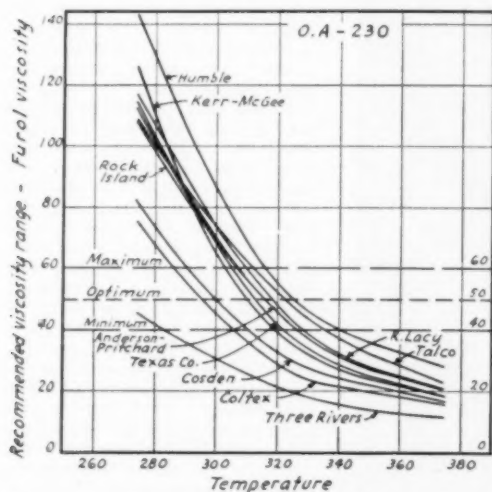
Figure IV is an Asphalt Application

Rate Chart, constructed from mechanical computations as here before explained, from which the gallons of bitumen per square yard can be obtained, after having determined the average aggregate mat thickness, and the percent of voids in the aggregate, and having selected the desired embedded depth. Along the vertical and horizontal axes we have indicated the average aggregate mat thickness for each 1/8 in. thickness up to 1 in.; also, the percent of aggregate mat embedded for each 5% from 20% to 50%.

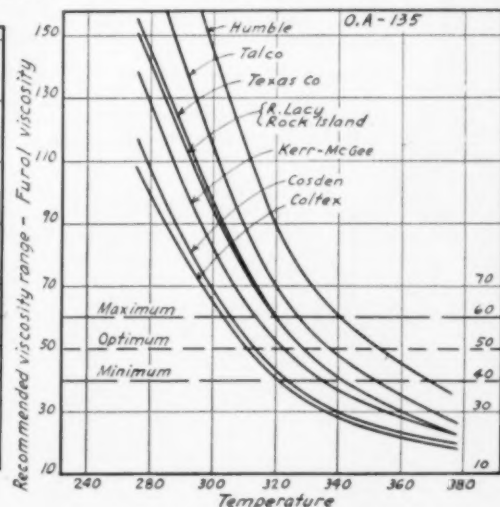
This shows gals. bitumen required. If liquid asphalts or emulsions are to be used, the rate of application should be increased proportionately to bitumen content. Note the broad variation in bitumen required, dependent upon the percent of voids which may be as low as 20% or as high as 50%.

It must be remembered that when applying asphalt surface treatments on existing fat asphalt surfaces and on loosely bonded or soft base courses, a portion of the aggregate during rolling will penetrate below the film of freshly applied asphalt, thereby reducing the effective mat thickness of the cover material. Also, that when the softer grades of rock are used, some of the larger sizes will be crushed by rolling, which will reduce effective mat thickness and voids.

Under conditions as mentioned above, it is recommended that embedding of aggregate be reduced proportionately to the resulting aggregate mat thickness dependent upon the existing conditions. We know of no way to actually determine to what extent aggregate may penetrate through the freshly applied asphalt and into a



★ Figure VII-a—Temperature-viscosity chart, OA230 oil asphalt



★ Figure VII-b—Temperature-viscosity chart, OA135 oil asphalt

Are you getting these *Bonus Benefits* of Red-Strand wire rope **QUALITY?**

Does your present wire rope deliver top tonnage?

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If you're not sure . . . **FIND OUT**

It means money to you. Leschen wire rope specialists will help you answer these questions . . . to your profit. There's no obligation. Ask them.

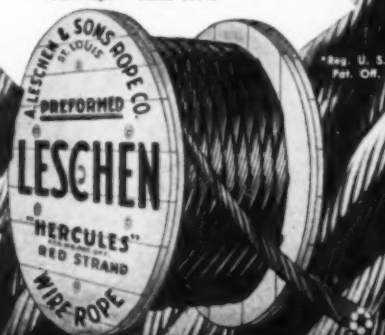
Write for your free copy of "Use and Care of Leschen Wire Rope."

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loosely bonded soft base, or into existing fat, soft asphalt surfaces, or to what extent the softer grades of rock will be crushed during rolling; however, these factors can be estimated to some valuable degree by placing one layer of the selected cover aggregate on the base or old asphalt surface which is to receive treatment, and observing its condition after thorough rolling with the type of rollers to be used on the job.

Treating Hard Surfaces

When applying asphalt surface treatments to existing hard paved surfaces or tightly bonded hard base courses, it is recommended that the percentage embedded be increased if hard aggregates are used, and reduced if aggregates are soft and break up under rollers.

Some allowance should be made, depending on the amount and type of traffic. For highways carrying high traffic counts and heavy vehicles, the percentage embedded should be reduced and larger aggregates used. For highways carrying light traffic counts and light vehicles, the percentage of embedding should be increased and medium size aggregates may be used.

Figure Va typically shows the gradation and distribution of Specification Aggregates, Grades 3 and 4, indicating the percent of various sizes, average aggregate mat thickness, recommended percent of aggregate mat embedded, and spread ratios. [Charts for other Grades 1 to 10 omitted for lack of space—Editors.]

The heavy dash line indicates the top of the average aggregate mat. The heavy solid line indicates the portion of the loose aggregate mat embedded in asphalt.

The percent of aggregate mat embedded in asphalt as recommended herein may appear somewhat light; however, this procedure is based on loose aggregate mats which, under traffic, will change considerably in that aggregate particles will be rearranged and further consolidation will take place, thereby reducing the aggregate mat thickness and percent of voids, and increasing the percent of aggregate embedded. Your attention is again invited to the possible and probable variation in average size and spread ratio within the specification limits, which is still greater with flat and elongated particles present.

Note the probable gap grading, especially in the fine gradation of each grade, with a very small percent of the top aggregate sizes, and a large percent of the bottom aggregate sizes. These gap graded aggregates frequently result in unsatisfactory asphalt surface treatments, because of the following:

If the quantity of asphalt used is sufficient to adequately embed and retain the average particle size, it is not sufficient to adequately embed and retain the top aggregate size. If the quantity of asphalt used is sufficient to adequately embed and retain the top aggregate size, the average particle size will be flooded with asphalt, resulting in an undesirable fat, slick surface.

Recommended Grading

Figure VI is a recommended grading of aggregates for asphalt surface treatments.

The oversize particles of aggregate permitted by the present Texas specifications are usually the flying stones that we hear so much about as being hazardous and damaging to traffic. The undersize particles of aggregates permitted are often so fine as to blot the asphalt film and prevent the larger aggregates from becoming embedded in the asphalt.

The present Texas specifications, in many cases allow a gap graded aggregate which is undesirable, and also allow aggregate graded uniformly from fine to coarse, with a maximum density and minimum voids, which is highly desirable for asphaltic concrete, but not desirable for penetration asphalt surface treatments.

The gradation of aggregates recommended herein will provide aggregates of nearly uniform size, which can be uniformly applied and spread without oversize particles, which most frequently are either crushed during rolling or fail to become embedded in the asphalt, and remain loose on the surface until broomed off or whipped off.

An aggregate of approximately uniform size, with a maximum of voids, is most desirable for penetration asphalt surface treatments, in order that a maximum amount of asphalt binder may be used without the aggregate becoming sufficiently embedded to result in a slick, bleeding surface. Also, the uniform size aggregates usually develop better interlocking qualities and provide lateral support to adjacent particles, thereby preventing displacement.

The specifications should limit the amount of flat and elongated particles in the aggregate, and define what shall be considered flat and elongated particles. Such particles should not exceed 10% of any gradation requirement. Definitions for flat and elongated particles:

Flat particles are those particles with thickness of less than one-half the average width of the particle.

Elongated particles are those particles with length greater than twice the

COMPARE St. Paul's Added Values!

New heavy-duty St. Paul dump body beams with powerful 2L24 twin hoist to deliver "bonus payloads" for Grasse Construction Co., Beacon Falls, N.Y.



Up to 22% more payload capacity per dollar!

15 to 50% lower mounting costs!

Up to 300 lbs. less dead weight per unit!

New 1952 St. Paul Hoist capacity chart

| Class | Model | Wt. lbs. | Payload tons rating at body lengths shown | | | | | | | | | |
|----------------------------|-------|----------|---|----|--------|--------|--------|-----|--------|--------|--------|--------|
| | | | 7' | 8' | 9' | 10' | 11' | 12' | 13' | 14' | 15' | 16' |
| Standard Duty 4 new models | D-16 | 550 | 7 1/2 | 6 | | | | | | | | |
| | H-16 | 650 | 9 | | | | | | | | | |
| | H-18 | 735 | | 9 | 8 | 7 | | | | | | |
| | H-20 | 795 | | | 11 1/2 | 10 | 9 | 8 | | | | |
| Heavy Duty 5 new models | L-20 | 870 | | | 14 | 12 1/2 | 11 | 10 | 9 | | | |
| | L-24 | 1020 | | | | 15 | 13 1/2 | 12 | 11 | 10 | | |
| | 2H20 | 1370 | | | | 20 | 18 | 16 | 14 1/2 | 13 | 11 1/2 | |
| | 2L20 | 1555 | | | | 25 | 22 | 20 | 18 | 16 1/2 | 15 | 13 1/2 |
| | 2L24 | 1695 | | | | 31 | 28 | 25 | 23 | 21 | 19 | 17 |

Note: 6 new conversion hoists for platforms also available.

Tear out this ad . . . use it to compare St. Paul's new "bonus capacities" with any other hoist on the market. You'll find St. Paul gives you far more payload capacity per dollar of cost — at all body lengths!

You'll also get more miles of smooth, trouble-free service —

thanks to St. Paul's exclusive new uni-flex sub-frame, with full-floating tension rods, equal-lift strut arms and improved friction-free hydraulic system. See these great new 6 to 31-ton capacity St. Paul hoists and dump bodies at your St. Paul Distributor today — or mail coupon below for free literature.

St. Paul HYDRAULIC

Hoists & Dump Bodies • Refuse Loaders
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ST. PAUL HYDRAULIC HOIST

Customer Service Department
34168 Main St., WAYNE, MICH.
Send free booklet describing new St. Paul hoists and bodies.

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Company _____
Address _____
City _____ State _____

S-HBC-4

other minimum dimension.

The following construction requirements and methods are recommended:

The temperatures of the air, aggregate and base or surface should be considered as controlling factors in determining suitable conditions for applying asphalt surface treatments, since each of these factors have much to do with the success of the application, in that the asphalt must remain in a tacky condition until covered and rolled, in order to obtain a satisfactory surface treatment.

The hard asphalt should be applied only when weather conditions are favorable, and when the air, aggregate and base or surface temperatures are each at or above 70° F.

Liquid cut back asphalts, road oils or emulsions may be used if weather conditions are favorable, and the air, aggregate and base or surface temperatures are each above 40° F.

Temperature Control

The application temperatures of hard asphalts should be controlled within certain limits, depending on the viscosity of the asphalt. Asphalt should not be applied at a greater temperature than necessary, because the process of spraying asphalt at excess temperature reduces its penetration and ductility factors, and frequently results in gravity flow of the applied asphalt, on inclined surfaces.

The viscosity of asphalt varies greatly with changes in temperature, and the viscosity of various asphalts vary greatly at the same temperature.

We have observed that best results can be obtained by heating the asphalts to such temperatures as to produce viscosity within a range of 40 to 60, with a possible optimum of 50.

Immediately after the asphalt has been applied, it should be uniformly covered with aggregate and thoroughly rolled with flat wheel and pneumatic rollers. Any void spots in the aggregate cover material should be filled, and any excess of aggregate should be removed prior to the first rolling. No blading nor brooming of aggregate should be allowed prior to first rolling. Early the following morning, or when the asphalt has become chilled and hard, the aggregate should be lightly but thoroughly broomed with a drag broom and then after the asphalt has become warm and tacky, the surface should again be thoroughly rolled with both flat wheel and pneumatic rollers. Early the following morning, or when the asphalt has again become chilled and hard, the completed surface should be lightly broomed with a rotary broom sufficient to remove any excess aggregate that may be loose on the surface, and rolled again as may be necessary.

In conclusion, we are of the opinion that there should be closer control on

gradation of aggregates and temperatures, and on rates of application of asphalts and aggregates, and as in the case of asphaltic concrete, there should be some uniformity in design methods for Asphalt Surface Treatments.

We do not presume that the design and test procedures, and application methods presented herein are the final answer. However, we do hope that some of the suggestions advanced in this paper will improve our work, and assist in arriving at the final answer.

We are indebted to Messrs. G. M. Garrett, W. W. Finley, R. J. Hank, J. C. Roberts, Marshall Brown, H. C. Carter, A. J. Van Dyke, and others in the Texas highway department for their outstanding work in experiments, tests, theories, and papers on this subject, which have developed a background for our theories. The writer is also indebted to Messrs. J. R. Mercer and H. A. Auvenshine for their able assistance in preparing this paper.

Neat Looking Bituminous Widening Job

On the Bituminous cover this month (Page 69) is pictured a very nice looking example of bituminous widening along a bituminous highway.

The scene is U.S. 64 in North Carolina west of the town of Mocksville. This heavy traveled east-west highway, paved 20 ft. wide, is considered to carry heavy enough traffic to justify the expense of widening and eventually resurfacing both for safety and reduction in maintenance costs.

According to Z. V. Stewart, Division Engineer, of the North Carolina State Highway and Public Works Commission at North Wilkesboro, the work pictured is typical of North Carolina practice, performed both by contract and state forces. The earth shoulder was first excavated by mold-board extension, then excess dirt was picked up by a belt loader. Crusher-run stone was placed 2½ ft. wide on either side of the pavement for a depth of 9 in. compacted. The widening strip was then surface treated as follows:

(1) A prime was applied consisting of 0.362 gal. per sq. yd. of asphalt emulsion AE-7.

(2) A bituminous mat application was made consisting of 0.442 gal. per sq. yd. of asphalt emulsion, grade AE-3.

(3) A split seal was applied consisting of 0.428 gal. per sq. yd. of asphalt emulsion, grade AE-3.

Emulsion materials were furnished by American Bitumuls Co. For the mat 45 lb. per sq. yd. of aggregate was used; for the seal, 37 lb. of aggregate.

Eventually, after a year or two a bituminous resurface will be placed full width over the roadway consisting of 300 lb. per sq. yd. of bituminous plant mix. Meantime, the widening has a marked difference in appearance from the old roadway, looking like an armored shoulder. These strips hence will receive some but not full traffic use during the immediate stage.

Manufacturers News

Harkness Named SM by Gurley. Daniel H. Harkness has been named sales manager of W. & L. E. Gurley, Troy, N. Y. Harkness, who is also secretary, joined the sales department in 1943.

Appointed Executive Secretary. Clifford V. Tobin has been appointed executive secretary, New York State Crushed Stone Association, Albany, N. Y.

Jahn Sales Office Moved. The division sales office of the Jahn Trailer Division of Pressed Steel Car Co., has been moved to the Hegewisch plant at 136th St. and Brandon Ave., Chicago, Ill.

Worthington Names Branch Managers. Paul J. Foley has been appointed manager of the Kansas City branch office of Worthington Corporation, Harrison, N. J. and William M. Fine has been appointed manager of the Milwaukee branch office. Mr. Foley succeeds W. R. Kennedy who has been named consultant to his successor.

Gar Wood Appointments. C. J. Berins has been appointed division manager, Wayne Division, Gar Wood Industries, Inc., Wayne, Mich. H. D. Chicorine has been appointed assistant division manager.

Donagher Promoted by Oliver. H. F. Donagher, formerly vice president in charge of export sales, has been appointed vice president and general sales manager of The Oliver Corporation, Chicago, Ill.

New Davey District Manager. E. L. Mitchell has been appointed southwestern district manager for the Davey Compressor Co., Kent, O. He will cover Texas, Louisiana, Arkansas and Oklahoma.

Evans Forms New Company. Robert G. Evans has resigned as vice president of the Clipper Manufacturing Co. and has formed the Robert G. Evans Co., 6315 Brookside Plaza, Kansas City, Mo., to distribute masonry and concrete paving equipment.

Brown Made Assistant Sales Manager. Leo M. Brown, heretofore south central district manager, St. Paul Hydraulic Hoist Division of Gar Wood Industries, has been appointed assistant sales manager of the division. Edward R. Curry succeeds Mr. Brown as south central district manager.

Mann Promoted by Armco. Warren S. Mann, heretofore sales manager of the Dixie Division of Armco Drainage and Metal Products, Inc., Middletown, O., with headquarters in Atlanta, Ga., has been appointed manager of the division. He succeeds Howard See, who retired on his 65th birthday on June 26.

Notes on Equipment and Materials For ENGINEERS AND CONTRACTORS

1 Dual Purpose Spreader

Dual purpose equipment for seal coat work and ice control is now offered by Century Engineering Co. Known as the Century Spread-All, the unit, installed on a dump truck, is attached or detached in a few minutes. When used for seal coating the Spread-All lays material in a uniform metered mat. The material is guided from the trough through channels formed in a steel apron. An agitator in the trough breaks up and moves material so that it falls in a completely uniform and accurate pattern. When used for ice control, a spinner is installed instead of the channeled apron. This spinner is level with the roadway at all times and prevents the spray of material from falling on passing cars. Whether used for seal coating or ice control work, the entire unit is controlled by one man from a finger-tip lever on the truck dashboard.

For further details circle number of this item on Readers Service Card.

2 Design Change for Traveler

An improved design change in its self-propelled, belt-type loader has been announced by J. D. Adams Manufacturing Co. The machine known as Adams Traveler, has been redesigned to load material from stock piles as well as windrows. Spiral blades on the full-floating feeder work the material in to 14 curved blades which place the material on the revolving conveyor belt. The feeder is hinged at the rear and is free to float so as to readily adapt itself to size of windrow or stock pile. Stock pile loading applications for the Traveler include the loading of such materials as gravel, crushed stone, sand, top soil, coal, cinders, oil-mix material, etc. As a windrow loader the Traveler finds its most universal application on the reclamation of highway grades to restore proper road drainage. On this type of work it is used for picking up, and loading into trucks, surplus ditch and shoulder material

behind a motor grader. Other windrow-loading applications include picking up surplus dirt on pavement widening and street building jobs, loading road-mixed patch material, loading surplus or waste scarified material, loading snow or wet leaves from city streets, etc. The rear section of the conveyor is adjustable, from the cab, to provide a wide range of discharge heights for trucks of varying sizes. The full-floating feeder, the entire front of the loader and the rear section of the conveyor may be raised or lowered through hydraulic controls from the operator's cab. The feeder, conveyor and the forward and reverse movement of the Traveler are controlled from operator's cab through over-center-type clutches. The Traveler is powered by an International industrial-type gasoline engine which furnishes power for operating the feeder and conveyor as well as propelling the machine. An auxiliary transmission is used which permits operating travel speeds as low as 0.23 m.p.h. and a top travel speed of 25.5 m.p.h. J. D. Adams Manufacturing Co., Dept. R-S, Indianapolis 6, Ind.

For further details circle number of this item on Readers Service Card.

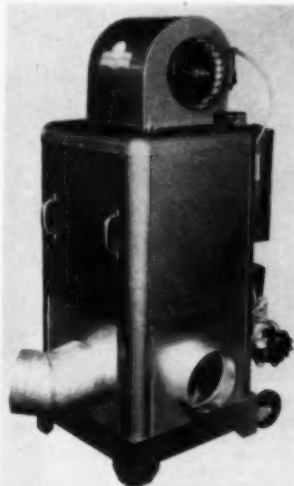
3 Control for Distributor Spray Bars

A new air-snap spray bar shutoff control for its asphalt distributors, developed by the Gunnison Manufacturing Co., is a series of valves at the spray bar which are closed and opened simultaneously by compressed air. Each series of valves is constructed in sections 3 ft. in length. Operated by finger tip control on the operator's platform, the shut off and starting actions are stated to be performed in a split-second. As a result it is stated, there is absolutely no dripping of the asphalt, and the starting and finishing sections are sharp and clean. The valves are also installed on the Gunnison swing bar extensions, which are hinged to swing back without damage if the bar strikes an obstacle.

For further details circle number of this item on Readers Service Card.

4 Machine for Heating Equipment

Production of special side panels for use with the Model PW-189 Fageol heat machine to permit its operation with warm air ducts has been announced by the Fageol Heat Machine Co. These adapter panels are made of heavy sheet steel with flanged openings for duct at-



Model PW-189 With Special Duct Adapter Side Panels

tachment and can be installed in a few moments' time. Addition of warm air ducts permits the use of heat machines in a great number of applications where concentration of intense heat on one spot or transfer of heat for substantial distances is required, the company states. Special applications include heating construction machinery, freight cars, truck cabs, drying agricultural products, heating buildings, thawing pipes and frozen ground, etc.

For further details circle number of this item on Readers Service Card.

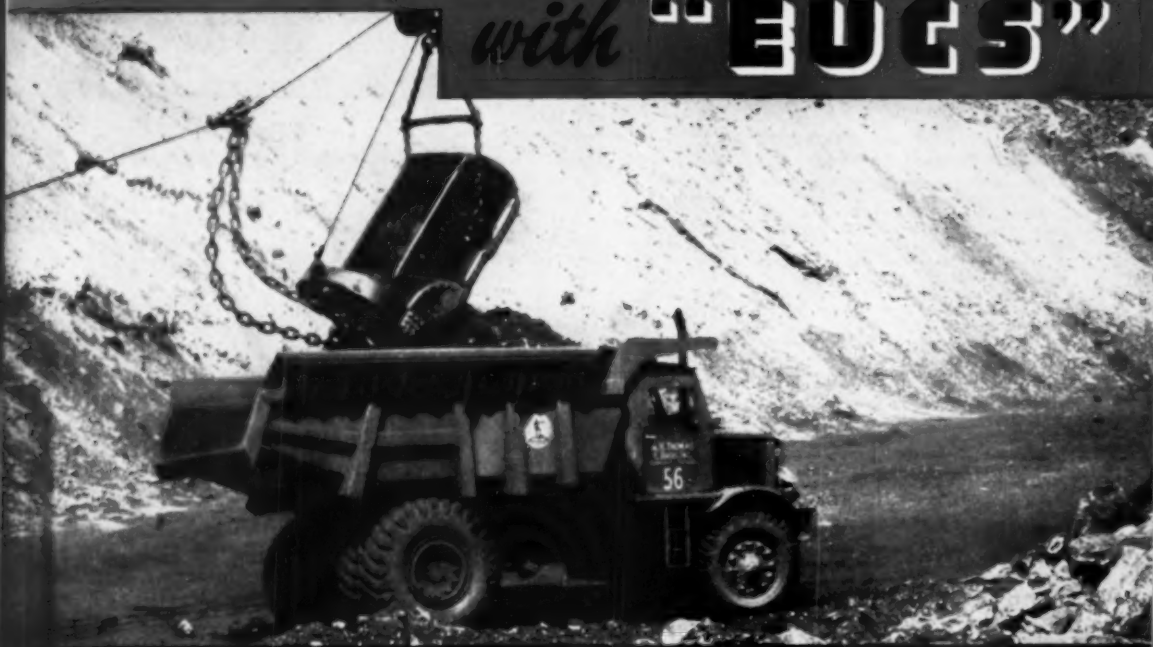
5 Trucks

Four new medium and heavy duty truck models have been announced by the GMC Truck and Coach Division of General Motors Corporation. Three of the new GMC diesels are six-wheelers to meet the growing demand for this type of unit by highway haulers, while the fourth diesel model was introduced to answer the need for light-weight, low-cost diesel power in the 21,000 lb. G.V.W.-45,000 lb. G.C.W. trucking field. Significant new developments in the GMC Models are: Shortening of all heavy duty models from bumper to rear of cab to



Traveler for Loading Material from Stockpiles

You Get Plus Performance with "EUCS"



(Above) Model TD Rear-Dump Euclid, 22 ton capacity... 14.6 cu. yds. struck... loaded top speed 32.4 m.p.h.... powered by 286 or 300 h.p. diesel engine.

(Below) Double-acting twin hoists and entire hydraulic system are of Euclid design and manufacture. Action is fast and positive enabling operator to control body position at all times.



REAR-DUMP EUCLIDS are engineered and built for lasting strength. Their ability to stay on the job, day after day and year after year, means more tons moved at lower cost... "plus" performance for owners.

"Euc" bodies have extra thick plates reinforced with heavy box section side and bottom supports. The rugged frames are built to withstand the impacts of hauling and dumping big loads... they're built to take the pounding and wear of loading earth, rock and other heavy excavation by large shovels and draglines.

Rear-Dump "Eucs" have many other "plus" features that make them standard equipment in mines, quarries and on construction work. For example, they have large capacity, ample power and traction for steep grades... speed on the haul road and full-floating, double reduction planetary type Euclid axle.

For information on equipment that is job proved on work similar to yours, get in touch with your Euclid Distributor or write direct for literature on the complete line of Euclid models.



The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO

EUCLIDS



Move the Earth



GMC Diesel Model DW620-47

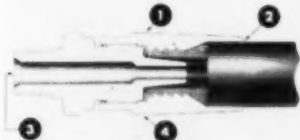
allow use of longer trailers in 45-foot length limit states. Electric shift introduced as standard equipment on all GMC trucks of the 450 and up model series having two-speed axles. New light-weight, load-cushion springs with fewer but thicker leaves adding to driver comfort and load safety through smoother ride. The new six-wheel diesel models are: DW450-37, which comes into a new field of diesel powered trucks, has ratings of 26,000 lb., G.V.W. and 38,000 lb. G.C.W. Standard transmission is 5-speed overdrive, while front and rear axles are 6,000 and 15,000 lb. capacity, respectively. Four wheelbases are offered, making available C.A. dimensions of 72, 84, 102 and 120 in. Brakes are the new air-actuated hydraulic type. Engine is the GM 3-cylinder diesel developing 110 h.p. and 282 lb. ft. torque. DW620-47, a new light-weight, tandem axle diesel with GM's 4-cylinder 150 h.p. engine, and ratings of 33,000 lb. G.V.W. and 55,000 lb. G.C.W. Air brakes and cast-spoke wheels are standard. DW630-47, a model succeeding the former HDCW-750, with ratings of 42,000 and 70,000 lb. G.V.W. and G.C.W., respectively. Front axle is 11,000 lb. capacity, while the SW-3010 worm drive tandem is standard at the rear. The 6231A and 8031C auxiliary transmissions are available for highway and off-highway operations, respectively. Chassis weight reductions amount to about 600 lb. D470-37, the other new GMC diesel model, brings diesel economy to the 21,000 lb. G.T.W.—45,000 lb. G.C.W. trucking field. Chassis weight is 1,400 lb. lighter than any diesel model previously offered in this capacity range. It is powered by the new 3-cylinder diesel. D630-47, formerly known as the HDCR-650, has the new 114-in. bumper to rear of cab dimension, electric axle shift control, cast-spoke integral type wheels, light-weight load-cushion springs and direct acting front shock absorbers. Its G.V.W. rating has been raised from 24,000 to 28,000 lb.

For further details circle number of this item on Readers Service Card.

6

Hose Line Couplings

A line of new couplings, developed by Lincoln Engineering Co., can be used



Lok-Tite Coupling

[1] Lok-Tite Positive Grip. [2] Faster, Easier Assembly. [3] Larger Volume Flow. [4] Eliminates Hose Extrusion

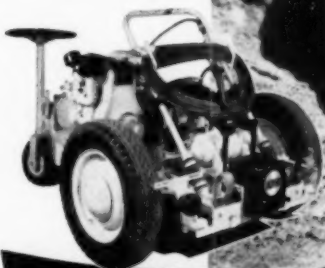


HERE'S **TREMENDOUS COMPACTION**

from a
SMALL FAST HIGHLY MOBILE UNIT!

4500 ONE AND THREE-QUARTER TON BLOWS PER MINUTE are supplied by the JACKSON Vibratory Compactor. It propels itself and is extremely easy to move from place to place by means of a quick pick-up trailer unit on which the power plant, from which it operates, is mounted. On numerous jobs, such as compacting asphalt in highway patching and widening, paving walks, drives, railway platforms and crossings, or in compacting granular soils for concrete floor sub-bases, in trenches, close to footings and abutments, there is nothing that approaches it in time and money-saving ability; and no equipment, regardless of size or cost, does a more thorough job. It will compact 900 to 1200 sq. ft. of asphalt per hour very close to the maximum density of the mix used. In granular soils, two quickly made passes produce maximum density to a depth of 12 inches. See it at your Jackson Distributor, who has it both for sale and for rent, or write for complete details.

SEE OUR CATALOG IN GILLETTE'S HEAVY CONSTRUCTION PRE-FILED CATALOGS



JACKSON VIBRATORS INC.

LUDINGTON, MICH.

U. S. A.

over and over again wherever there are flexible hose lines. Advantages claimed for the coupling include: where core of hose is inserted in sleeve, wire braid is flared and gripped between shoulder of Stud and Shelf of Sleeve with tremendous clamping force. Eliminates dependence on pressure from wedging the core in the sleeve to hold Coupling to hose. Bell-shaped counter bore of sleeve eliminates difficulty in starting hose into Coupling. Wire braid on hose tends to expand on flare. Bell-shaped bore engages flared ends acting as a screw, simplifying assembly. Extra large flow-passage in stud, plus shorter overall length of stud, reduces restriction to a minimum. End of core is completely confined by metal—assures safer handling, positive leak-proof performance.

For further details circle number of this item on Readers Service Card.

7

Pusher Unit

A new pusher unit, called the Tournatractor, for contractors who are using dozers exclusively as pushers is being offered by R. G. LeTourneau, Inc. The



Tournatractor, New Pusher Unit

★ **NEW TECHNIQUE SAVES BETWEEN \$1,000 AND \$1,500 PER MILE!**



**FILLING
A TRENCH
IN
TENNESSEE**



**SHOULDER
BUILDING
IN
WISCONSIN**



**LAYING
CONCRETE
IN
ILLINOIS**



**ALL DONE
WITHOUT
FORMS!**

★ . . . Chief state highway engineer, estimates the new technique will reduce widening costs by as much as \$1,000 to \$1,500 per mile and cut the time required for laying the highway strips by one-half.

—from a prominent Midwestern newspaper

SEND FOR COMPLETE SPECIFICATIONS

ALL PURPOSE SPREADER CO. Myrtle, Ohio U.S.A.

pusher is a new version of the Super C Tournadozer with the dozer blade, power control unit, A-frame and dozer controls omitted. In place of these is a massive billet, 3 in. x 15 in. spanning the width of the machine. On the billet is a large pusher plate. The Tournatractor can be equipped with a torque-converter as original equipment and is equally adaptable to pulling operations, either with a rear power control unit or with its drawbar alone. If later the need for a dozer develops the billet and pusher plate can easily be removed and the A-frame, power control unit and dozer added. The Tournatractor is offered with a variety of tire choices to meet various job conditions.

For further details circle number of this item on Readers Service Card.

8

Ultrasonic Thickness Tester

The great economy, speed and convenience of non-destructive thickness measurements by the ultrasonic Andigage thickness tester can be materially increased under awkward conditions by the use of a new magnetic fixture, announced by Branson Instrument, Inc., to hold the searching unit against the plate



Andigage Thickness Tester with New Magnetic Fixture

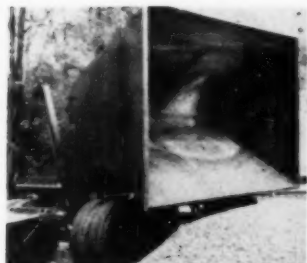
being tested. This accessory assures good contact and prevents accidental shifting of the searching unit during tests, and permits one man to operate the instrument alone in different locations. It is particularly valuable when working on ladders or staging, and when test points are beyond easy reach, such as tank bottoms and sides. The fixture consists of a flat spring with an Alnico permanent magnet coupled flexibly to each end, and means for attaching the searching unit quickly and easily to its center. The standard magnets are of sufficient strength to hold the unit properly against surfaces that are slightly irregular or covered with a thin coat of paint; heavier magnets can be provided for use on cast iron and other rough surfaces, or on plates that are covered with thick coatings of paint or scale. The standard fixture is only 5 in. wide and weighs 6 oz.

For further details circle number of this item on Readers Service Card.

9

Side Dump Truck Bodies

A new line of side dump truck bodies



Galion Roll-Over in Dumping Position

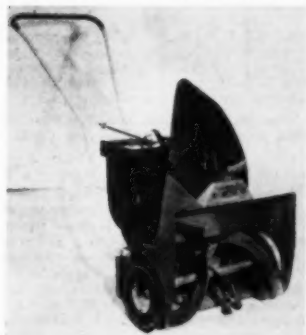
for heavy duty applications has been announced by The Galion Allsteel Body Co. Known as "Roll-Over," the bodies are available in a wide variety of sizes and capacities. Entirely mechanical in operation, the Roll-Overs dump to either right or left side, as desired. Bodies are of 10 gauge steel, can be mounted on all standard trailers. The self-contained subframe consists of three heavy box type outrigger cross members. Front and rear outriggers are built with a series of gear-like teeth which roll inside the formed channel tracks welded to the body. This construction locks the body in a stationary position and prevents forward or backward movement of the body on the subframe. Main locking mechanism is down-pull spring-loaded type plunger pin which engages in a socket built into an angle welded to the head of the body. Lock pin is actuated by a lever mounted to an A-type frame welded to the front of the subframe. Lever can be operated from either side of body.

For further details circle number of this item on Readers Service Card.

10

Home Owners Snow Plow

A new revolutionary home type snow plow is in production by Toro Manufacturing Corporation. The plow collects the snow through a screw-action rotor and propels it up and out of a directional chute. The new plow, named the Snowhound, has a 17 inch plowing swath, is powered by a 2½ hp Briggs and Stratton 4-cycles engine. It is easily pushed, having three points suspension on two disc type steel front wheels and a semi-pneumatic rear wheel. The plow throws snow 10 to 15 feet, to the right or to the left of the machine, through a spring loaded chute, which can be shifted without other adjustment. The height of cut



"Snowhound" Rotary Plow

Here's *Exactly* What You Need For All-Weather Pavement Patching and Small Jobs—

IN FALL, WINTER,

SPRING OR SUMMER

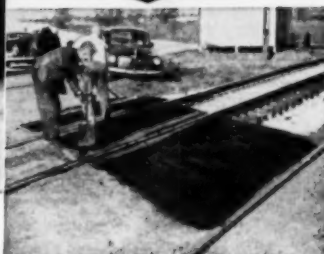


MODEL

HTD



Patches may be made and opened to traffic immediately. No cover aggregate is required. Economy!



Railroad crossing repair or construction is especially well suited to HTD Mixer; also small jobs.

THE "MULTI-PUG" ASPHALT MIXER

Prepares Hot, Cold or Heated Mixtures
on the Job —For Immediate Use!

Just hitch a McConaughay HTD Mixer to your truck and you'll be all set to make quick, economical pavement repairs in any season, under wet or dry conditions; also fully equipped to handle any small surfacing jobs. For the HTD (rigidly tested by many users) will handle on-the-job mixtures of asphaltic concrete, sheet asphalt, sand asphalt or mastic asphalt... hot, intermediate or cold... at the rate of

1 to 3 minutes per batch, enabling you to meet all conditions with least effort, at lowest possible cost. With 3 cubic feet capacity, powered by a 6 h. p. air-cooled engine and equipped with 2 vaporizing coil burners and fuel pump, the HTD can do a remarkable job for you the year 'round. Engineering service and construction advice furnished. Write today for details and specifications.

K. E. MCCONNAUGHAY
LAFAYETTE 2, INDIANA

is from zero to 1½ in., and it can be adjusted so it won't scrape on sidewalks or gravel driveways. In tests it plowed snow two feet deep.

For further details circle number of this item on Readers Service Card.

11

Machinists' Files

A new item in the Bite Rite line of files for industrial use has been announced by Henry Disston & Sons, Inc. Called the "Multi-metal" file, the new file is specially designed for the machinist who must work on a wide variety of metals. The files have special tooth shapes and spacing so that the same tool will cut aluminum, brass, copper, iron and steel, and other metals. Sides are double-cut; edges are single-cut. Multi-

metal files are stated to combine fast cutting and long life with a minimum of clogging. They are packed six to a box, in lengths of 10, 12 and 14 in.

For further details circle number of this item on Readers Service Card.

12

Power Roller

A new power roller, announced by Consolidated Industries, Inc., is stated to combine low first cost with low operating costs. It is available in two models: a lawn roller with weight adjustable between 300 and 1200 lb.; and an all-purpose roller, with weight adjustable between 375 and 1400 lb. The latter model carries a springler tank with a capacity of 15 gal. of water. Operation is stated to be unusually simple and features con-



Con-Sol's New Power Roller

venient grouping of controls on the handle bar, a tiller-type steering bar, and a single lever for both forward and reverse. Substituting a caster-type roller for the sulky roller gives maneuverability for rolling around shrubbery plantings. The roller is powered by a 2½ hp Briggs & Stratton engine.

For further details circle number of this item on Readers Service Card.

13

Portable Air Compressors

Three new units have been added to the line of GYRO-FLO portable compressors of Ingersoll-Rand Co. The introduction of 315, 210, and 105 cfm units makes the advantages of the rotary sliding-vane design available for a wide range of operating requirements. Major benefits claimed by the manufacturer are simplicity and low cost of operation and



Gyro-Flo Air Compressor

maintenance, and greater reliability. The two-stage, oil-cooled rotary sliding-vane compressor design of the GYRO-FLO machine is claimed to eliminate most of the problems of reciprocating units for portable service. There are no valves to leak, no pistons, rings, rods or clutch to wear. Air, discharged at less than 200° under normal operating conditions, together with thorough oil separation, eliminates hose deterioration caused by heat and oil. The continuous rotary action is stated to provide a steady flow of air without pulsations or vibrations.

For further details circle number of this item on Readers Service Card.

14

Anchor Augers

Designed especially for boring holes for expanding anchors, three new triple-flight anchor augers have been added to the Pengo earth auger line of Petersen Engineering Co. The new augers retain the identical cutting features of the Pengo earth auger, except that a three-flight single helix is used to carry dirt out of the hole instead of the valves utilized on larger augers. This is stated

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Makes old roads and streets look—and ride—like new!

Moto-Paver does the complete mixing and laying job on resurfacing work—in one continuous operation. Speeds the job—cuts the cost. Produces a smooth, waveless surface even on rough, irregular pavement. Makes old roads and streets look—and ride—like new. Gives a uniform mix using beach sand, gravel, crushed stone or slag aggregates, and various bituminous materials including tars, cut-back asphalts, road oils or emulsions. Road speeds up to 25 mph. make possible quick moves from job to job.

Standard and heavy duty models for all types of resurfacing, retreat and stabilization jobs under all kinds of operating conditions. See your local H & B distributor or write for Bulletin MP 49.

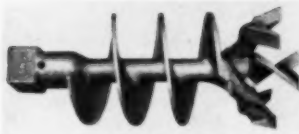


HETHERINGTON & BERNER INC.

Engineers • Manufacturers

721 Kentucky Avenue

Indianapolis 7, Indiana



Pengo Anchor Auger

to permit completion of the hole with less than half as many trips up and down, and cleans the bottom of the hole better. The size of the center shaft is reduced, which is said to make it possible for the first time with a small diameter auger to bring rocks out of the hole. This auger is intended for use in all types of soil, but is most outstanding in hardpan, sandstone, frozen ground, permafrost, or anywhere the going is tough.

For further details circle number of this item on Readers Service Card.

15 Circular Saws

A new complete line of circular saws, announced by Henry Disston & Sons, Inc., includes saws for all types of bench saws or portable electric handsaws. From 4½ to 12 in. in diameter, these blades for portable electric handsaws are made in all tooth types, with center holes to fit every type of mandrel on portable electric handsaws. The line for bench saw needs is made of alloy steel, and each saw is individually packaged and clearly labeled. This line includes the new Safe-Feed saw, a completely different, highly efficient blade, especially designed to prevent kick-back. Only eight teeth, combined with a more stable blade, produce smoother cutting with less power expenditure, helping to prolong motor life.

For further details circle number of this item on Readers Service Card.

16 Truck Bodies and Hoists

The Convento Manufacturing Co. has expanded its line of PicUpac truck bodies and hoists for trucks ranging from ½, ¾, and 1 ton in size to include a new medium-duty line of hoists and bodies. This new medium-duty line of bodies and hoists are manufactured for trucks of 1½, 2 and 2½ ton sizes. New additions for heavier-duty lines are being built and tested at Convento. Convento, at present, manufactures two



Convent New Truck Body and Hoist

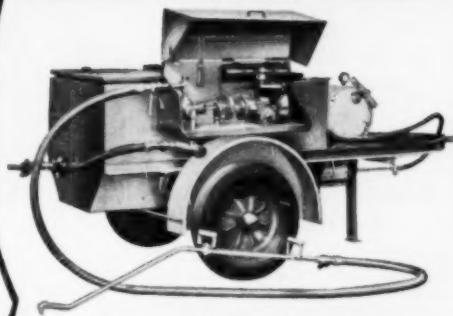
styles of hoists. The "double arm" type hoist is used for extreme loads, while the "direct" hoist is used for average loads and is lower priced. Both hoists elevate the truck body to a full 60° dumping angle in a matter of seconds.

For further details circle number of this item on Readers Service Card.

17 Drill Press Mortising Attachment

A mortising attachment of improved design has been put into production by Sout hBend Lathe. It consists of a fence assembly which bolts to the drill press work table, a mortising chisel holder which clamps to the drill press quill and three sizes of mortising chisels and bits; ¼ in., ¾ in. and 1½ in.

CONSIDER THE LENGTH OF SERVICE



LITTLEFORD 84 HD Kettle for MAINTENANCE



When purchasing an item for a particular job, we all want to get value for our dollar. Something that is the best, will last long and give service. The same is true when buying a Kettle for Road Maintenance work; a value is what City, State and County Highway Departments and Contractors are looking for. This Littleford 84-HD Kettle is an item that gives value for every dollar invested. The 84-HD gives years of service without spending additional money in repairs. Many 84-HD Kettles have been in service for 20 years or better. That's why Littleford can say "consider the length of service" when buying a Kettle. Patented features have made the 84-HD the low cost operating unit in addition to its sturdy, efficient, and long life. Why purchase anything but the best in Black-Top Maintenance Equipment; invest your dollar wisely and get a Littleford 84-HD Kettle.



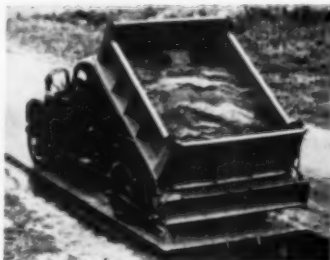
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Spreads salt, chloride, sand,
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Swenson Spreader & Mfg. Co.
Lindenwood, Illinois



Two new features distinguish this drill press accessory. First, the two guide arms, which are attached to the fence, adjust separately to handle irregular shaped pieces. Second, the fence has a 1" independent adjustment on the base. These flexible adjustments give the attachment more capacity; up to 5½ in. under the forked hold-down and as much as 4½ in. between the guide arms and fence.

For further details circle number of this item on Readers Service Card.

18

Fork Lift Trucks

The first 6000 lb. capacity fork lift trucks ever manufactured by The Buda Co. has been announced as being avail-

able in two models: gasoline powered model FT60-24 and diesel powered FTD60-24. The fork lift trucks are rated at a 24 in. load center and are available with a choice of two gasoline or two diesel engines. Model FT60-24 is powered with



Buda 6000 lb. Capacity Fork Lift Truck

a Buda 73½ hp, six-cylinder gasoline engine and is available as optional equipment with a Buda 4-cylinder, 53½ hp gasoline engine. A 6-cylinder Buda diesel engine with a 230 cu. in. displacement is standard for model FTD60-24 with an optional 4-cylinder, 182 cu. in. displacement diesel engine. A 72 in., 84 in., 108 in., 114 in. or 120 in. lift is available as standard on either the Buda diesel or gasoline powered 6000 lb. for trucks.

For further details circle number of this item on Readers Service Card.

19

Roller Chain

A special roller chain incorporating oil-impregnated sintered metal bushings has been introduced by Whitney Chain Co. The new chain, requiring little or no lubrication, was designed by Whitney Chain to satisfy a recognized need for a chain drive which would operate efficiently where conventional lubrication methods are either not possible or desirable. Exhaustive laboratory tests and field installations of the new sintered bushing chain indicate a marked increase in service life on applications where normal lubrication is not available, according to the manufacturer. An insight into the possibilities of the new Whitney Chain can be gained by the findings of a recent laboratory test. In this test, a ¾ in. pitch oil-impregnated sintered bushing chain and a ¾ in. pitch standard roller chain, prelubricated to the best practice, were installed on 19 tooth and 45 tooth sprockets having a center distance of 8.75 in. The two chains were then run under a 10 hp load at 1900 rpm. At the

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America's Finest,
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Controlled direction, width and quantity of spread. Integral agitator to break and move material. Plus rugged hydraulic power system that provides for high speed continuous operation as well as intermittent spreading under all conditions.

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**PORTABLE
DUST COLLECTOR**

...MADSEN DESIGNED
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Here is the Madsen 280 Asphalt Paving Plant Dust Collector unit! Equipped with the rugged Madsen No. 80 Exhauster, outstanding in paving plant service, this collector unit offers portability, high rating in dust collection, low head height, compact square design (patent pending), and many other features important to the contractor, whether he moves frequently from job to job or operates at a permanent site. The unit is mounted on its trailer frame with Diesel engine and power take-off to 3 KW generator to power the gathering screw and transfer screws used in dust conveyance, from collector to hot stone elevator.

May be equipped with electric motors throughout.



Madsen builds a complete line of Dust Collectors in a wide range of capacities. Let us know your requirements.

Equipment that serves

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is saving time and money for contractors and highway departments the country over. From large to small, they are all proving the economical operation of our spreaders.

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- STREET DEPARTMENTS
LARGE CITIES—(as Philadelphia)
SMALL CITIES—(as Huntington, Ind.)
- COUNTY HIGHWAY DEPARTMENTS
- LARGE CONTRACTORS
Operating up to 4 hot mix plants.
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Doing driveway work

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Use With 45 and 165 Concrete Mixers—
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Pull Unibatch behind pickup truck.

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Used in 70 Different States

end of 20 hours operation, the standard, prelubricated roller chain showed wear or elongation of .380 in. The oil-impregnated sintered bushing chain showed a wear or elongation of but .080 in., indicating an increase of several hundred per cent in anticipated service life.

For further details circle number of this item on Readers Service Card.

20

Pipe Threader

A Universal nipple chuck (Beaver "55") capable of threading $\frac{1}{8}$ in. to 2 in. pipe, placed on the market by Beaver Pipe Tools, Inc., has but three parts: a polished steel body, a sliding plunger and a hardened steel threaded shank. Nipples are easily removed by hand, no wrenches required. Adapters allow for all sizes from $\frac{1}{8}$ -in. to 1 $\frac{1}{2}$ -in. pipe. No adapter is needed for 2-in. pipe. An inserted pin retains the sliding plunger in working position.



Beaver "55" Nipple Chuck

For further details circle number of this item on Readers Service Card.

21

Pilot Bit for Auger

Designed for rapid penetration in hard-to-bore soils and faster digging in ordinary soils, the new "Pengo Jr." pilot bit for Danuser augers is now in production by Petersen Engineering Co. Patterned after the Pengo hardpan pilot bit used on heavy-duty augers, the new bit features a live-action "fishtail" design which eliminates the centerpoint and the resulting tendency to pivot on stones or hard ground. Forward-angled cutting lips either side of the center line "slice" a pilot hole ahead of the wedge-shaped main pilot blade, which in turn breaks up the earth ahead of the auger helix. Rapid penetration in hard-to-bore soils and faster boring in ordinary ground are features claimed for the new unit.



Pengo Jr. Pilot Bit

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3 sweeper models, axle, engine or tractor powered.



Chip spreaders 8' to 12' width. Also asphaltic concrete spreaders.



Rapid Fire circulating heaters heat and unload large tanks of asphalt.



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Sheepfoot Rollers
250 to 600 psi.



Pneumatic rollers
7 to 50 tons.

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Short, High
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This is just *one* of dozens of exclusive Etnyre advantages. For the complete story, phone your nearby Etnyre Dealer or get in touch with us today!

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BITUMINOUS DISTRIBUTORS



CURRENT TRADE LITERATURE

Listed below are brief notes on bulletins, booklets, catalogs, brochures and circulars of particular interest to contractors and engineers. This current trade literature is yours for the asking. Just circle the numbers of the desired items on the Reader Service Card and mail. We will do the rest.

81 DIBBEL PILE HAMMERS: Symton Co. 4-page catalog on self-contained dibbel pile hammers. Descriptive matter, data on hammer sizes for various types of piles and specifications are included.

82 TRACTOR EQUIPMENT: Hyster Co. 6-page catalog on equipment for use with Caterpillar tractors. Complete line of Hyster tools is illustrated and described and practical applications of the equipment are pictured.

83 ALDADDES: W. & L. E. Gurley. 28-page booklet on the use and adjustment of aldaddes. Helpful information on use of aldaddes in both exploration and map making, as well as detailed instructions in stadia surveying are given.

84 AIRPORT PAVING FORMS: Blaw-Knox Division of Blaw-Knox Co. 12-page bulletin describing new heavy-duty, self-aligning paving forms developed especially for airport paving. Detailed construction features and complete specifications are given.

85 CLEARING EQUIPMENT: Florida Land Clearing Equipment Co. 4-page circular on Flere specialized land clearing equipment for use with track type tractors. Equipment includes detachable stumpers, root rakes and rock rakes.

86 SELF-PROPELLED AIR COMPRESSORS: Schramm, Inc. 12-page catalog illustrating and describing the pneumatic tractor, its attachments and its auxiliary equipment. Illustrations, descriptions and specifications of attachments and auxiliary equipment are included.

87 TRACTOR ATTACHMENTS: Caterpillar Tractor Co. 20-page catalog shows many possibilities of adapting Caterpillar diesel tractors to specific jobs. Explains uses and construction of tractor attachments. Thirty action photographs supplement the catalog views.

88 SOIL COMPACTION: Barco Manufacturing Co. Technical bulletin containing cost data for soil compaction in restricted areas. Cost figures are based on survey of actual jobs and are intended to be useful to contractors in preparing bids.

89 BIN LEVEL INDICATORS: The Indicator Co. Catalog illustrating and describing line of bin level indicators, contains complete installation data for various type of units, for thin or thick walled bins, for inside or outside locations and for suspended interior installation.

90 ELECTRIC PLANTS: D. W. Onas & Sons, Inc. Folder describes types and sizes of Onas electric plants for public utility needs. Full information and specifications for plants from 400 to 5000 watt sizes in AC and DC models.

91 TRAFFIC SIGNS: Cataphoto Corporation. Bulletin illustrating and describing reflectorized and plain traffic signs. Four types of reflectorized signs are shown. Included are street name signs, potholes and accessories.

92 CRANES, HOISTS, ELEVATORS: American Hoist & Derrick Co. General catalog covering all equipment from giant revolving cranes, through extensive line of locomotive cranes, hoists, material elevators and car pulleys. Actual on the job pictures are shown.

93 TRENCING MACHINES: Gar Wood Industries. Catalog illustrating and describing Models 214 and 222 wheel type

ditchers. Model 214 is a pipe line and utility ditcher featuring a fluid sampling. Model 222 is a versatile medium utility ditcher.

94 RUST PREVENTIVE: Rust-O-Seum Corporation. 16-page catalog listing rust preventive applications. Catalog features use of color throughout to illustrate exact color. Detailed information and technical data are given.

95 AIR-ENTRAINED CONCRETE: Asbestos Lubricants Co. New and enlarged edition of Protex placement on concrete fact book. Contains technical information and field-use tips on air-entrained concrete. Includes information about air-entraining technique and Protex air-entraining solutions.

96 SHOVELS, CRANES, DRAGLINES: Link-Belt Spreader Corporation. General line catalog providing handy data on all current models. Illustrations, brief descriptions and applications of 16 models are given. Of particular interest is listing of master books containing complete data on each model.

97 SOIL SAMPLING: Asher Drill Co., Inc. 16-page bulletin on soil sampling in all subsurface conditions, shallow or deep, with hand or power driven tools. Modern sampling techniques are discussed and recommendations given as to tools and accessories best suited for soil sampling.

98 TRANSMISSIONS: Fuller Manufacturing Co. Booklet contains condensed specifications on entire line of Fuller heavy-duty transmissions and auxiliaries. Data includes number of speeds, type of mounting, gear ratios, engine size and installation directions.

99 BLASTING UNITS: Mine Safety Appliances Co. Bulletin describes a new multiple-shot blasting unit, incorporating improved firing action, safety and dependability in a compact lightweight assembly.

100 BUILDING AND PAVING PRODUCTS: The Philip Carey Mfg. Co. Reference manual contains complete listing of 500 building materials and industrial products obtained from asbestos, asphalt or magnesia. Specifications are given.

101 HOSE ASSEMBLIES: Curlye Rubber Co. Catalog gives specific data on rubber hose assemblies for all types of construction equipment.

102 ROD CUTTING TOOLS: Mason Mfg. Co. 8-page catalog on the Gull-loc line of portable hydraulic cutting tools illustrating and describing air series of cut-off line and 36 different models. Their uses, capacities and specifications are included.

103 TRACTOR SERVICE TOOLS: Owa-tonna Tool Co. 12-page manual gives complete information on new OTC tools especially designed for servicing International tractors. Both manual and hydraulically operated tools are shown.

104 TRAFFIC CONTROL: General Electric Co. Three bulletins on traffic control. Bulletin GEA-4441 covers Type F controllers, universally applicable in the field of pre-timed traffic control. Bulletin GEA-4442 covers Type DH Traffic signal controllers. GEA-4443 covers adjustable traffic signals.

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105 ROADGRADER GAUGES: Road-grader Gauge Corporation. 4-page circular illustrating and describing road-grader gauges. These gauges are attached to any motor grader to make a fine grading unit.

106 EARTH MOVING: The Euclid Road Machinery Co. Revised and enlarged edition of book entitled, "Estimating Production and Costs of Material Movement with Euclids." Contains many useful charts, illustrations, formulas and reference tables. Although the book is intended for use in making production and cost estimates for Euclid Earth Moving Equipment, the estimating methods and formulas can also be applied to equipment of other makes.

107 MATERIAL HANDLING SYSTEM: Brooks Equipment & Mfg. Co. 44-page catalog illustrating and describing the Brooks Load Lifter and its many applications in low cost material handling.

108 CONCRETE VIBRATORS: Mall Tool Co. 32-page catalog with line of concrete vibrators and other concrete tools. Illustrations, descriptions and specifications are included for 10 models of concrete vibrators.

109 EMERGENCY POWER PLANTS: Universal Motor Co. Catalog containing specifications for emergency standby light plants with capacities of from 700 to 50,000 watts in both gasoline and diesel power, air or water cooled units.

110 SAND BLAST MACHINES: Remolin Manufacturing Co. Bulletin illustrates and describes line of sand blast generators, available in sizes from 50 lb. to 2,000 lb. of sand capacity.

111 ENGINEERED TIMBER CONSTRUCTION: Timber Structures, Inc. 9-page brochure containing dimensions and design data. Included are descriptions and illustrations of glued laminated girders and beams and glued laminated arches. Useful tables are included.

112 LATHE ATTACHMENTS: South Bend Lathe Works. 36-page catalog illustrating more than 150 different attachments for South Bend lathes. Attachments can be easily adapted to other makes of lathes.

113 PROTECTIVE COATINGS: Rulley Tar and Chemical Corp. 34-page booklet on protective coatings for metal surfaces exposed to corrosion, tuberculation and incrustation. Covers hot application enamels, primers, and coupling compounds, cold application enamels and bituminous paint.

114 PAVING PRODUCTS: W. R. Meadows, Inc. 8-page catalog on seal-tight paving products gives complete descriptions, helpful installation hints and ordering information on asphalt, fibre and corkfill joints, etc.

115 PORTABLE ELECTRIC TOOLS: The Black & Decker Mfg. Co. 74-page catalog covering complete line of portable electric tools, attachments and supplies. Illustrations, descriptions and prices are included.

116 TRAFFIC SIGNS: Eastern Metal of Metals, Inc. Brochure showing complete line of Eastern Metal traffic signs in color. Features patented "A" stand for highway cross which cannot blow over in strong winds or from backwash of passing trucks.

117 WELDING EQUIPMENT: Miller Electric Manufacturing Co. Catalog showing scope of Miller equipment. Thirty-one models are illustrated and described and specifications are given.

118 MUNICIPAL PARKING: M. E. Rhodes, Inc. Booklet containing practical and helpful advice in solving critical traffic and parking problems in cities. Gives specific plans for making best use of curbside parking spaces so they will be more available to communities errands and clientele parkers.

119 BLASTING UNIT: Mine Safety Appliances Co. Bulletin describes a new multiple-shot blasting unit, incorporating improved firing action, safety and dependability in a compact and lightweight assembly. The unit weighs 1 lb. and is carried on the belt. It will fire up to 10 shots simultaneously.

120 REDUCTION GEARS: Snow-Habstock Gear Corporation. 4-page folder illustrating construction, industrial and farm machinery driven by engines equipped with S-N industrial reduction gears. Many possible applications on the construction field are shown.

121 WHEEL-TYPE MEASURING INSTRUMENT: Rolaplate, Inc. 8-page circular describes the Rolaplate and tells how it is used for measuring horizontal, vertical, overhead and curved surfaces.

122 TRAILERS: Dorey Trailers. 8-page circular containing descriptions, illustrations and specifications for Models M and MK low bed heavy duty trailers in 10-ton to 25-ton capacities.

123 PORTABLE POWER TOOLS: Mall Tool Co. 36-page booklet containing illustrations and descriptions of saws, planes, drills, sanders and screwdrivers.

124 VALVES: Wilkerson Valve Co. 12-page catalog illustrating and describing automatic evaporators and drains for compressed air lines, automatic pump, automatic tank drains, air governors and governor filter.

125 FEEDERS: Pioneer Engineering Works. 20-page booklet covering complete line of manganese steel feeders for quarries, mines and cement plants. Contains operational data, including capacities, horsepower and dimensions enabling the proper selection for every type of installation.

126 COMBUSTION SYSTEMS: Hopkins Volcanic Specialties, Inc. Two bulletins on combustion systems for asphalt plants. Bulletin 1601 covers oil and gas burning systems—a complete package unit for asphalt plants. Bulletin 999 covers oil burning equipment.

127 HEAT MACHINES: Fagool Heat Machines Co. 6-page circular illustrates and describes Fagool Heat Machines used on construction operations. These machines are independent, self-controlled portable heating units, utilizing the most economical methods of heat transfer and direct heat circulation.

128 CONVEYOR BELTING: New York Belting & Packing Co. Catalog on conveyor and elevator belting gives all necessary data to layout a drive or specify a belt. Tables are given on carrying capacity, horsepower factors, pulley diameters, etc.

129 HYDRAULIC JACKS: Tompkins, Kenly & Co. Bulletin No. 61-E contains complete information, including specifications and application data. Contains illustrations, detail drawings and tabulated data on hydraulic equipment from 10 to 100 tons capacities.

130 DIESEL TRACTOR: Caterpillar Tractor Co. 22-page catalog illustrating many applications of Caterpillar D4 diesel tractor. Attachments and specifications are listed. More than 50 photographs and illustrations are included.

22

Materials Dump Body

A new truck dumping body for hauling building materials has been placed on the market by J. E. Woods Manufacturing Co. The body has a length of 168



Rolls—Dump Truck Body

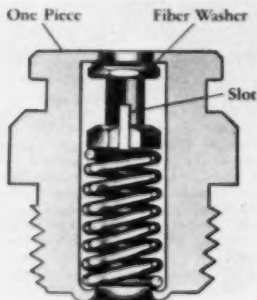
in. for handling average loads and a length of 192 in. for extra long loads. It is of all metal construction. The body is designed to eliminate damage to materials while unloading. When dumping, the entire bed of the truck is elevated by a hydraulic hoist to a dropping position within 10 in. of the ground.

For further details circle number of this item on Readers Service Card.

23

One-Piece Grease Fitting

A new Universal giant buttonhead grease fitting is now being manufactured by Universal Lubricating Systems, Inc. Employing a design stated to be new to the field, the Universal giant buttonhead fitting is



Buttonhead Grease Fitting

built to provide maximum grease flow. It is stated to prevent the leaking possible with conventional two-piece buttonhead fittings which can be separated by extreme pressure or jolting. One-piece construction imparts stronger, longer-wearing, abuse-resisting qualities, according to Universal tests. The new product also features a strong steel inner-spring which combines with a fiber sealing washer to prevent grease leak-back.

For further details circle number of this item on Readers Service Card.

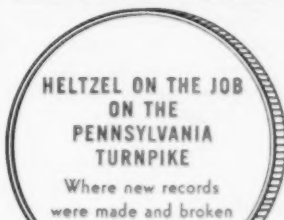
24

Flasher Warning Light

A new Neo-Flasher warning light, designed for construction jobs, municipal repair work and utility maintenance, has been introduced by Light Products, Inc. The light bolts securely on barricader. The cost of operating the "Neo-Flasher barricade unit" is stated to be approxi-



**HELTZEL HELPS
CONSTRUCTION DOLLARS
GO FURTHER**



PROBLEM: To select batching equipment of speed, accuracy and ultra portability to put paving operations on a much faster schedule than ever attained.

ANSWER: After charging as high as 140 batches per hour on an airport project this batching operation was moved to the Pennsylvania Turnpike where this high production was maintained.

Heltzel Type One for aggregates and Type E2 for bulk cement were set in line for continuous truck drive-through. Using dual batchers, 2-batch trucks were loaded in one stop and 3 and 4-batch trucks in only two stops.

Type One—Capacities: 52, 72, 85 and 100 tons; used with 1 1/4-cu. yd. Universal Batchers or 2 1/2-cu. yd. Dual Batchers.

Type E1*—Capacities: 100 and 200 bbls.

Type E2*—Capacities: 300 and 400 bbls.

*Used with 14-cu. ft. Dustless and 28-cu. ft. Dual Dustless Batchers.

Capacities may be increased with hopper extensions and recirculating tanks.

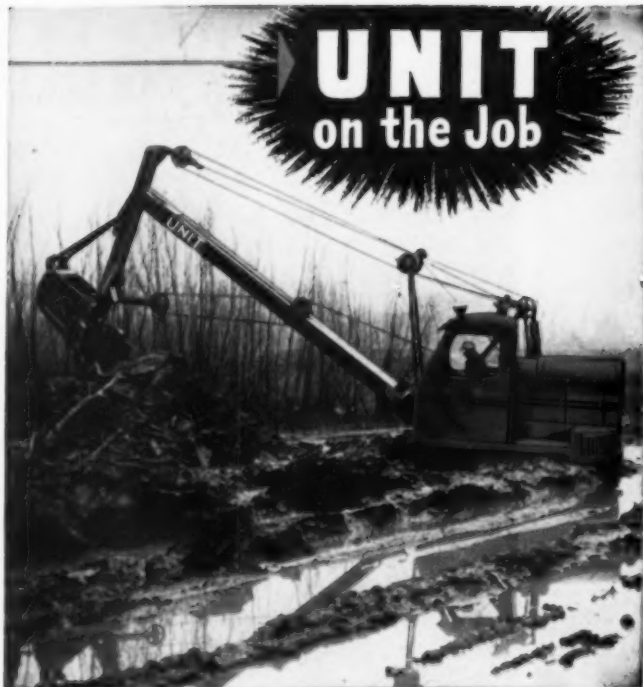


The Heltzel Steel Form & Iron Company

Construction Equipment Since 1910



WARREN, OHIO



TOUGH GOING . . . and no doubt about it! Here's a UNIT Excavator that's really **IN** but still **ON** the job. Regardless of the swampy ground, there's always plenty of power to provide dependable crawler traction. UNIT machines are designed for just this type of performance under difficult conditions.

The famous UNIT One-Piece Gear Case assures perfect alignment of all working parts. Twin Hook Rollers . . . Automatic Traction Brakes . . . Interchangeable Disc Clutches plus quality construction make it possible for UNIT to meet the most rigid demands. The streamlined **FULL VISION CAB** provides maximum visibility in all directions, assuring **SAFE** and **EFFICIENT** operation.

A comparison will prove you just can't beat UNIT for **SPEED**, **FLEXIBILITY** and **TROUBLE-FREE** performance at low cost.

SEE FOR YOURSELF: Let us send you our novel TV Brochure. It illustrates the complete UNIT line.

UNIT CRANE & SHOVEL CORPORATION
6407 WEST BURNHAM STREET • MILWAUKEE 14, WISCONSIN, U. S. A.



1/2 or 3/4 YARD EXCAVATORS...CRANES UP TO 20 TONS CAPACITY
CRAWLER OR MOBILE MODELS . . . GASOLINE OR DIESEL



All Models Convertible to ALL Attachments!



Neo-Flasher Barricade Unit

ately 2 cents per night. Other outstanding features claimed for the Neo-Flasher are that it requires no maintenance, no fuel, no labor, completely weatherproof, no fire hazard, and will operate for approximately 1000 hours on one Neo-Power Pak battery. The Neo-Flasher L series are available in either the regular 120 flashes per minute or the faster 200 flashes per minute, completely equipped with clips, tamper-proof switch and fastening devices for pouring concrete to form a block; case-hardened chain may be slipped through the holes of the mounted clips or bolted to poles, trees, etc.

For further details circle number of this item on Readers Service Card.

25

Self-Propelled Concrete Cutter

A new model concrete cutting machine announced by Felker Manufacturing Co. features a power drive. A 13 1/2 hp Wisconsin air-cooled engine not only amply drives the diamond blade but furnishes power to the rear wheels through a stepless variable-speed reducer and friction drive. Speed may be adjusted from a mere crawl to a fast walk by rotating a crank. The diamond wheel is raised or lowered by a built-in double-acting hydraulic jack. This jack also expedites coupling the machine to a trailer hitch for towing, front wheels automatically retracting as valve is released. Depth of cut is established by an adjustable stop. The machine can be steered, rear wheel position locking after establishing



Felker Di-Met Model 252 Self-Propelled Concrete Cutter

line of travel. Front and rear guides are provided. The new model uses diamond wheels on either end of the 1½ in. spindle in diameters from 10 in. through 18 in., 14 and 18 in. wheel guards are instantly interchangeable for right or left hand use.

For further details circle number of this item on Readers Service Card.

26

Leak Stopping Products

A liquid claimed to stop direct leaks below grade in 30 seconds without removing hydrostatic pressure has been placed on the market by Dasco Chemical Co., Inc. The product, called Dasquik, is an extremely fast-setting purple liquid that has been developed for extreme pressure leaks. It has an initial setting time of 30 seconds when mixed with plain Portland Cement. It is claimed it will stop leaks against pressure without removing the pressure and, even when used by unskilled labor, will give satisfactory and permanent results.

For further details circle number of this item on Readers Service Card.

27

Centrifugal Pump

A new low cost general purpose centrifugal pump has just been placed on the market by Jacuzzi Bros. Inc. This



Series AM Pump

new Jacuzzi centrifugal is called the Series AM pump and is designed primarily for economical pumping of large capacities at moderate heads. Sizes range from ¼ through 5 hp.

For further details circle number of this item on Readers Service Card.

28

Five Color-Coded Hose

Thermoid Co. has announced the consolidation of its molded hose line from 18 different types into five basic types, color-coded for identification according to use. The new line is stated to offer as much versatility as, if not more than, did the former line of 18 types because of improved performance gained from the use of new components. These include rayon braids of high tensile strength, instead of cotton, and new tubes and covers of both natural and synthetic rubber. Reduction in the number of hose types was adopted in order to provide substantial savings to users and distributors in inventory, handling and storage costs. Only five types of hose need be stocked, naturally, instead of the former 18, to cover the same range of use. Many hose users find that one or two of the new types answer their hose needs which formerly required several hose types.

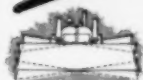
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Straight Down to Paydirt!

Designed for maximum down pressure through toughest conditions, Baker Hydraulic Blades go down positively and stay down positively—with the exact bite desired—fingertip-controlled by the operator.

Regardless of blade tilt or angle, Baker's superior design provides straight-line force through hydraulic cylinders to blade—permitting nearly entire weight of tractor to force blade straight down to pay dirt!

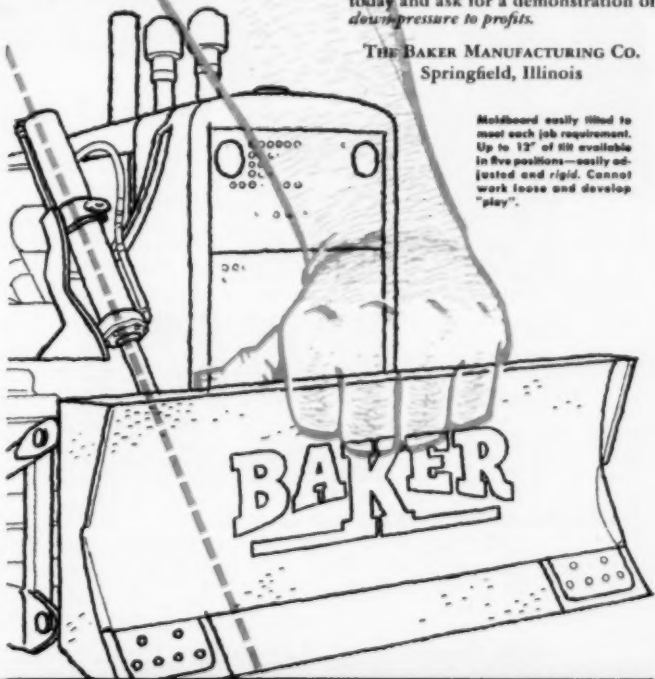


The versatile line of Baker Bulldozers, Grade-builders and Root Rippers—all interchangeable—is manufactured exclusively for Allis-Chalmers tractors. Three mountings are available: Engine-mounted hydraulic; frame-mounted hydraulic (the revolutionary 9-X "no-pushbeam" Dozer), and cable-controlled types.

Contact your Baker, A-C Dealer today and ask for a demonstration of down pressure to profits.

THE BAKER MANUFACTURING CO.
Springfield, Illinois

Moldboard easily tilted to meet each job requirement. Up to 12" of lift available in five positions—easily adjusted and rigid. Cannot work loose and develop "play".



Baker—The most versatile line of tractor attachments



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DON FORKE



DEAN FORKE



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HAROLD McMULLEN, Lincoln, Nebr., "... We think Forke Bros., got for us at least \$10,000.00 more than we could have received at private sale ..."

Learn the advantages of a properly conducted, properly advertised auction from the firm of experience and which handles all details of the sale. Last year, 14 heavy equipment auctions conducted, all successful. Without obligation, call or write for full information and inspection—sales conducted throughout the nation.

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- 1—Meili-Blumberg Model PG 10 motor grader
- 1—International Model UD24 180 h.p. power unit
- 2—International Model UD18A 125 h.p. power units
- 1—Ray City Model TS 3/4 yd shovel
- 1—Insley K 10 3/4 yd shovel
- 2—International TD18 crawler tractors
- 2—International TD9 crawler tractors with bulldozers
- 2—International Model ID6 and 16 wheel tractors with Hough shovel loaders

ROSHOLT EQUIPMENT COMPANY

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4-6801

FOR SALE

SHOVELS & DRAGLINES:

MARION #46A Dragline, 80' boom, 3 cu. yds. Buda diesel, air operated, excellent condition.

MARION #383 Dragline, 60' boom, 2 cu. yds. Waukesha Hesselman diesel, vacuum swing.

MARION, Electric Shovel, model #4160, 4 yd. capacity, 2300 volt, 3 phase, 60 cycle caterpillar mounted.

P & H Electric Shovel, model #1400, 3 1/2 yd. capacity.

BUYCRUS ERIE #320B Electric Shovel, 13 yd. capacity on Anaco crawlers, 4100 volts.

BUYCRUS ERIE #120B Electric Shovel, 5 yd. capacity, 2300 volt, good operating condition.

BUYCRUS ERIE #120B Electric Dragline, 2300 volt, 5 yd. capacity, 85' boom, excellent condition.

LIMA #1201 Dragline, Cummins Diesel, 85' boom, 3 yd. capacity, 1947 machine.

LIMA #1061 Shovel, 3 1/2 yd. capacity, Waukesha Diesel, 1943 machine, good condition, cheap price.

LORAIN #77 Dragline, 1 1/2 yd. capacity, Cat. D13000 Diesel.

TRUCKS:

23—EUCALID TRUCKS, Model 277D & 28FD, Cummins Diesel.

8—MACK TRUCKS, Model 28 T, rock type bodies, end dump, Cummins Diesel, 15 yd. capacity.

AIR COMPRESSORS:

1—180 CFM Worthington diesel portable, skid mounted.

1—315 CFM Worthington diesel portable, skid mounted.

"Let us have your list of surplus equipment.
We may be able to sell it for you."

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2500—2' x 3' Universal "Uni-Form" Panels with plywood faces on steel frames in good condition. All or any part at \$5.00 each, f.o.b. Chicago.

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1949 Caterpillar No. 12 Motor Grader with open cab, Serial 8T3032 \$9000.00

Le Tourneau C. Roadster Tournapull with 671 G.M. Diesel and E-18 Carryall Scraper, Serial GM 9T3817. Price \$22,500.00

Allis Chalmers H.D. 20H Crawler Tractor with 28 inch Grouser Shoes and Gar Wood CT-203 Cable Bulldozer with rear mounted dual drum cable control. Serial HD20H-3524.

\$22,000.00

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FOR SALE THREE MODEL TS-300 LaPLANT-CHOATE MOTOR SCRAPERS

- POWERED WITH BUDA DIESEL 6-DS-844 ENGINES
- TIRES 24x29, 24 PLY. TIRES BETTER THAN 90%
- CAPACITY 17 CUBIC YARDS STRUCK
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- LOCATED IN SEATTLE
- EXCELLENT CONDITION

Priced F.O.B. Seattle . . .

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FOR SALE

- 2—Universal Jaw Crushers 10 x 36. Serials 27543 and 27549
- 1—Chicago Pneumatic Air Compressor 315 C.F. Caterpillar Diesel D-8800 Power Unit

Above located in Wyoming

- 1—Universal Jaw Crusher 10 x 36, Serial 27521

- 3—Koehring Dumpsters Model W-55, Case Gasoline Power Units

- 1—Bucyrus-Erie Crane 1 1/4 Yard, GA-3 Model, Serial 11643, Powered by Wisconsin Gasoline Motor Model D-2

Above located in Wisconsin

- 1—Ingersoll-Rand Air Compressor, 315 C.F. Serial 40D-25126 with International Diesel Power Unit.

Above located in Alabama

E. C. Schroeder Co., Inc.

McGREGOR, IOWA

PRICED FOR QUICK SALE

- 3—NEW ID-9 at 20% below list price.
- 1—NEW Caterpillar 75 dozer complete, 10% below list.

- 1—Caterpillar 7A dozer, complete, 85% new.

- 2—Hyster D8N Winches - 80% new.
- 2—Hyster D7N Winches - 80% new.

- 1—Hyster D6N Winch - 85% new.
- 1—NEW Hyster D4N Winch - 10% below list.

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- 2—Cleveland Tamper-Backfillers, each \$3,000.00
- 1—Corbett Tractor, Hughes Carry-All Trailer 4,500.00
- 1—Backhoe for 25 Northwest, 1 buckets—Wide & Narrow 2,750.00
- 1—Buckeye Trencher, Model 13, Excellent Condition 4,750.00
- 1—Backhoe Bucket for Good 600.00

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FOR SALE ASPHALT PLANT EQUIPMENT

Including dryers, aggregate hoppers, storage tanks, bucket conveyors, batch mixers and scales, boiler pumps, electric motors, exhaust and dust collecting system. Will sell entire twin plant or any part. Structure also available.

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Other equipment at low prices.

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Construction Equipment

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| 1—Mod. 1201 Lima comb. shovel & dragline.... | 580,000.00* | 1—365' Sullivox diesel port. comp. 4 pneu. wheels | 4,500.00 |
| 1—Mod. 800 Northwest comb. shovel & dragline.. | 47,000.00* | 1—500' Gardner Denver port. air comp. on 4 pneu. wheels | 6,500.00* |
| 1—Mod. 800 Northwest shovel only | 28,900.00* | 1—400 KW Enterprise dual fuel generating plant 2400 V. | 35,000.00 |
| 3—D8 Caterpillar tractors w/PCU & dozer — 2 U series..... | 10,745.00*ea. | 1—100 KW Superior diesel generating unit—440 V. | 4,500.00 |
| 1—D8 Caterpillar tractor w/PCU & dozer—1M series | 5,000.00 | 16—200 H. P. Peterbilt Tractors with Cummins Diesel | 7,800.00 ea. |
| 4—TD24 International tractors, bare, 1500 series... | 10,350.00 ea. | 5—16 cu. yd. Badell semi-trailer and dump rock trailer w/KBR International tractor, butane... | 4,000.00*ea. |
| 1—D4 Cat. tractor w/ML4 Athay mobiloader... | 5,900.00 | 11—13 yd. Euclid Mod. 43FDT bottom dump Euclid G.M. diesel | 13,575.00 ea. |
| 2—DW10 Cat. Pneu. Tractors w/PCU and Dozers. | 10,400.00 ea. | 4—9.7 yd. Euclid Mod. 49FD end dump Euclid—G.M. diesel | 13,575.00 ea. |
| 2—DW10 Cat. units w/4500 gal. McCay Sprinkler Trailer | 12,000.00 ea. | 2—98VB Euclid loaders w/blade side cutter..... | 18,000.00 ea. |
| 2—LeTourneau Super C Tournapulls w/LP scrapers | 5,300.00 ea. | 2—Mod. 12 Cat. motor patrols w/scarifier.... | 7,750.00*ea. |
| 1—Mod. LP LeTourneau carryall | 4,000.00 | 1—Mod. CA154 Mobile batching plant—used 6 months | 22,000.00 |
| 1—Mod. 80 Cat. scraper w/extensions—90% | 10,500.00 | 1—Lot Blow Mass steel cantilever forms | |
| 6—Mod. 22 Gebhardt DD tamping rollers | 2,700.00 ea. | 1—Lot 36' conveyor equipment complete w/ frames and drives | |
| 1—12-ton Duquesne diesel elec. locomotive, std. gauge | 8,500.00 | 1—Lot Moretrack Wallpoint pumps and accessories | |
| 1—New Mod. HBL Budo earth drill w/accessories | 5,000.00 | | |
| 1—365' (actual) G.D. Mod. WBN air comp. V. drive by GM diesel | 6,500.00 | | |
| 1—575' (actual) G. D. Mod. WBU air comp. V. drive by GM diesel | 10,000.00 | | |
| 2—105' Gardner Denver port. air comp. on 2 pneu. wheels | 1,800.00 ea. | | |

Also a large inventory of Caterpillar, International, Euclid, LeTourneau and General Motors parts, as well as a wide selection of tools, pumps, transformers, supplies and mess-hall equipment.

*Items so marked will be available about June 1st—other items are now available.

All of above equipment located at Republican City, Nebraska.

THE FOLLOWING EQUIPMENT IS LOCATED ON THE WEST COAST:

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|--|-----------------|---|------------------------------|
| 4—TD24 Int. Tractors, bare, 1500 series | \$10,350.00 ea. | 1—297 Bucyrus-Erie blast hole drill | 7,700.00 |
| 1—D8 tractor w/PCU and dozer | 9,500.00 | 3—500' C.P. port. air compressors, diesel..... | 6,500.00 ea. |
| 1—D6 Cat. w/Mod. T6 Transcavator | 7,500.00 | 4—500' I. R. port. air compressors—oil | 5,400.00 ea. |
| 18—20 cu. yd. Western end dump rock trucks—diesel | 7,750.00 ea. | 5—4 cu. yd. Dumpcrete (Mason) bodies | 1,500.00 ea. |
| 6—20 cu. yd. Sterling end dump rock trucks—diesel | 5,000.00 ea. | 1—3 yd. Owens type DX rd. nose clam. bucket... | 3,000.00 |
| 12—16 yd. Utility and dump trailer w/Peterbilt tractor | 10,000.00 ea. | 1—V4 Parnasco horizontal auger drill, gas | 2,500.00 |
| 3—Mod. W LeTourneau carryalls..... | 6,000.00 ea. | 1—Model 58V Euclid loader—Cummins..... | 18,000.00 |
| 1—Mod. FU LeTourneau carryall | 7,500.00 ea. | 1—25 ton x 95' Stiffleg derrick | 7,500.00 |
| 1—Mod. C86 LePilot Choate carryall | 2,750.00 | 1—9' x 9' Sullivan compressor Mod. WG9—electric | 1,500.00 |
| 2—4500 gal. Western sprinkler trucks—Cummins Diesel | 8,000.00 ea. | 4—18"—12000 g.p.m. Economy pumps, electric.. | 7,350.00 ea. |
| 2—3000 gal. Sterling sprinkler trucks—Cummins Diesel | 7,000.00 ea. | 1—20 ton Polster-Williamette skyhook—1200'.... | 20,000.00 |
| 7—UM99 Gardner Denver wagon drills | 1,400.00 ea. | 1—Navion airplane, 100 hrs. since comp. modernization | |
| 2—G200R Chicago Pneumatic wagon drills..... | 1,200.00 ea. | 3—Mod. 12 Cat. motor patrols — 9K series | \$5,000.00 to \$7,500.00 ea. |

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USED EQUIPMENT

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| 1—TL-20 Lorain Dragline (Top Condition)..... | \$9500.00 |
| 1—¾ Yd. Link Belt Speeder w/shovel, trencher, dragline, clamshell attachment, including buckets..... | \$3950.00 |
| 1—Insley Shovel Trailer (practically new)..... | \$1200.00 |
| 1—4½ Yd. Jaeger Truck Mixer (perfect)..... | \$2000.00 |
| 1—2½ Yd. Jaeger Truck Mixer (fair)..... | \$ 500.00 |
| 1—3 Yd. Jaeger Truck-Mixer (fair)..... | \$ 500.00 |
| 1—2½ Yd. Rex Truck Mixer (perfect)..... | \$1500.00 |
| 1—4 Yd. Dumperette..... | \$ 700.00 |
| 1—315 Gardner-Denver Air Compressor-Gas..... | \$1500.00 |
| 1—315 Worthington Air Compressor-Gas..... | \$1200.00 |

ANDREWS EQUIPMENT SERVICE OF WASHINGTON, INC.
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SPOKANE 9, WASH.

FOR SALE

- 1—Caterpillar Tractor D7 with angledoser, late model.
- 1—Caterpillar Tractor D4 with angledoser, late model.
- 1—Caterpillar Tractor D6 with angledoser, 8U series.
- 2—Caterpillar Tractors, with angledosers.
- 1—Allis Chalmers Tractor HD-14.
- 1—Insley Model K-12, ½ yd. diesel crawler crane, late model.
- 2—Insley Models K-12, ½ yd. Gas Crawlers, one equipped as a Backhoe, the other as a Crane.
- 1—Lorain Model 88, 1½ yd. Diesel Crawler Crane.
- 1—General Model 267, 10 ton Self Propelled, rubber tired Crane.
- 1—Caterpillar 212 motor grader, AT Series, late model, only two years old. Guaranteed A-1 condition.
- 1—12½ Ton Capacity Le-Boy trailer with tractor.
- 1—60 HP Erie City economic boiler with complete boiler room equipment, about two years old.
- 1—Quickway Model J truck crane combination dragline and backhoe and ½ yard bucket. Mounted on Autocar FWD truck. Both excellent condition. Sacrifice for quick sale.
- 1—Link Belt Speeder, Model LS-50, ½ yd. Combination Backhoe, Dragline and Clamshell, new 1950, with dragline, clamshell and concrete Buckets and Fairleads, 60' boom, Buda gas engine.
- 3—500 foot Ingersoll Rand Diesel Air Compressors, late models, mounted on rubber tires.
- 1—International Tractor TD14, with Bucyrus Erie Angledoser, rebuilt, late model.
- 2—BRAND NEW 12,000 gallon capacity each, STEEL WATER STORAGE TANKS, horizontal, 5/16" thick plates, never used.

All above equipment in good condition.

"Try us first, for good, dependable equipment at the right price."

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National Machinery Co.

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FOR SALE

- Barber-Greene Model 705 Ditcher with IHC Model J8 Gasoline Engine. In excellent condition \$3500.00
- Rebuilt GMC Model 671-RC55 150 horsepower diesel powered unit, radiator cooled with clutch, hood sides, on skids. Gone over completely—like new \$2800.00

STONE Manufacturing Co.

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P & H 1055 LC 110' boom, 3 & 4 yd. buckets, Buda Diesel '48 machine.

LIMA 1201 dragline, Cummins L engine.

LIMA 34 shovel ¾ yd. G.M. Diesel.

LORAIN 820 shovel, D-13000 engine, hyd. coup.

MARION 38A drag, 70' boom, 2½ yd. bucket, Buda Diesel.

LIMA 34 Paymaster Comb. Shovel & Dragline. Very good.

INSLEY K-12, 1949 machine just rebuilt. Chain drive, 24" tracks extra cwt. 40' boom, ¾ yd. bucket.

BUCYRUS-ERIE 218, rebuilt, good cheap crane or dragline.

BROCKWAY winch truck, 10:00x20 12 ply dual rear tires are good, 16' pole, head-ache rack, oil field bed, Tulsa winch. Cheap.

FREUNAU High-Boy flat top trailer, 10:00x20 14 ply tires, 22'x8" deck, vacuum brakes. Very good.

BARGAIN BUY—BULLDOZER 1948 TD-18 Heil cable blade, DDPCU, dozer in good shape, has new tracks \$6500.00.

SINDLINGER SUPPLY CO.

New & Used Construction Machinery
Clifton, Indiana Phone 1223W

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One (1) - New Set Tracks - 855 PH.

One (1) - New Boom for 855 PH Shovel Front.

One (1) - New Boom for LS75 Link Belt Shovel Front.

One (1) - Crane Boom for 600 PH. 45 ft.

Caterpillar D8800 Engines - Caterpillar D13000 Power Units, IHC - TD14 - UD14 - Engines.

Two (2) - AD4 Diesel Allis Chalmers Graders, 1949.

ALSO

Many parts for IHC - Cat. AC Tractors. Many parts for Graders.

FOR SALE: D7 Roller Shells, Double Flange.

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"Caterpillar" D-6 Serial No. 9-U-2108 w/ Traxxon cable loader working everyday
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1950 IHC model LF 190 tandem tractors, 1949 IHC model KB8F tandem tractors. Excellent condition, ready for work. Hendrickson tandems and completely equipped with fifth wheel, heater, defroster, HD generator, automatic radiator shutters, air horns and spot light.

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THREE PAN MODEL IM5LC DAGLINES—4 cu. yd. capacity. All powered with Caterpillar D175 Diesel Engines. Crawlers 31" long with 48" wide crawler shoes. Located Central Alabama. Good condition. Ages range from 4 to 8 years. High lift shovel fronts also available. Reasonably priced. Contact:

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1 Standard H & B 60" x 24 dryer complete with combustion chamber, dryer motor and drive, exhaust fan and motor, cold elevator motor, 1 1/2" Hauck low pressure burner, no turbine.
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Both items in perfect condition.

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Immediate Delivery. Two exceptionally clean Caterpillar D-8 tractors, 2-U series, with Model 25 PCU and LeTourneau LP scraper. All fine mechanical condition and good rubber. Priced right.

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| No. Pieces | 296 |
| Length | 40-0 |
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| (2 sheets interlocked) | 7.875" |
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| Twenty Upset TB steel rods | |
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DIESEL ELECTRIC LOCOMOTIVE

One 43 Ton General Electric Diesel Locomotive, Standard Gauge, Class BB-86-86-2. Powered by two Model H81 Cummings Diesel Engines.

Price at Umatilla, Oregon

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Two 1949 KB-8 International Dumps with bodies in excellent condition, each **\$3,000.00**

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ONE USED CLYDE MODEL HBT HOIST AND TOWER
W/80' Tower 2 drum Clyde Hoist, Reconditioned. Wisconsin Gasoline Motor. Location: Springfield, Missouri.
THREE USED JAEGER 165 CONCRETE MIXERS

One Rubber Mounted Rebuilt Wisconsin Gasoline Motor, A-1 Condition.
THREE 23 T WINSLOW 2 Compartment Binabatch Units.
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1201—2 years old. Rebuilt and guaranteed, 85' boom. Like new.

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ONE (1) PIONEER 30"x50' Portable Conveyor complete with belt mounted on Hydraulic Cradle Truck with Tumbler Shaft Drive, with Tail Shaft extended for driving Feeder.

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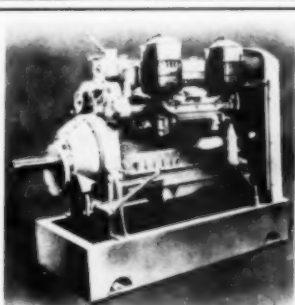
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This plant has screened less than 30,000 yards and is in perfect condition.

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Model 6-71 Power Unit
Brake H.P. 90 to 200 H.P.
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\$2450.00

FOR Brooklyn NEW COST \$5000.00

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- 1—Buckeye Model 70 Shovel, Crane and Dragline, G.M. Diesel engine, used 9 months, 3/4 yd.
- 1—International TD-18 Tractor with BE hydraulic angledozer, completely rebuilt and excellent condition.
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- 1—Caterpillar RD-6 Tractor with Trackson sideboom. Excellent condition.
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5000 feet 9 x 9 Blaw Knox Road Forms. Several Crane booms for 3/4 to 2 yd. Machines.

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- 2—LaPlant-Choute Model TS-300 Motor Scrapers. Rebuilt and ready for service. Priced to sell. Can be seen at

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Des Moines, Iowa

BARGAINS IN USED EQUIPMENT

- 2—LeTourneau Model W Scrapers—Serial Numbers S28106WE—and S28379WE. Tires 24:00 x 22. Condition good.
- 1—Caterpillar # 12 Motor Grader—Serial Number 9K1964SP—complete with cab and scarifier, 14-ft. blade, new tires on tandems. Completely rebuilt.
- 1—Caterpillar D8 Tractor—Serial Number 2U6948—complete with #25 Caterpillar Cable Control and 88 Caterpillar Doser.

Contact us if interested in your other machinery needs.

TRACTOR AND EQUIPMENT COMPANY

Sidney, Montana

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All Located in the Two Carolinas. Will rent with purchase options to qualified parties.

- 1—Koehring 34 E. Dual Drum Pavers with GMC Diesel Engines
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- 2—Blaw Knox Concrete Spreaders 20'-25'
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PAVING COMPANY**
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Two Wooldridge "Terra-Cobras,"
Serial TA-14383 and TA-14382.
Good Condition. \$10,000.00 ea.

**CAROLINA TRACTOR
& EQUIPMENT CO.**

Salisbury - Asheville,
North Carolina

FOR SALE

- 1—Gallon #110 Diesel motor grader.
- 1—TD34 I.H. tractor w/Bucyrus Bulldozer blade (cable).
- 3—TD18-A I.H. tractors w/Bucyrus-Erie angle blades (cable).
- 1—F.P. LeTourneau scraper, dual tires, Good buy.
- 1—F.P. LeTourneau scraper, current model, four 21 x 24 20 ply tires, Rubber good.

Above equipment is in excellent condition and is priced for quick sale. May be seen by appointment.

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Frankfort, Kentucky

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- 1 Caterpillar D8 Tractor, 8R Series 5,250.00
- 4 Caterpillar D8 Tractors, 1M Series, Each 4,250.00
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- LeTourneau F Scraper 2,500.00
- Bron 13 Wheel Roller 1,150.00
- Tampa 13 Wheel Roller 1,150.00
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For sale or lease with purchase option—
3 Caterpillar DW10's with Caterpillar 10 Scrapers Latest Models, Each 13,000.00

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28 Surplus New Belt Conveyors

- 30 INCH 1-136' — 1-270' — 2-350' — 1-418' — 2-500' — 1-1100' & 2-1500' Long.
- 36 INCH 1-160' — 2-250' — 1-320' — 1-400' — 1-590' — 2-1000' & 1-1600' Long.
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3 SURPLUS NEW VIBRATING SCREENS
ALLIS CHALMERS 6'x14' 2 DECK RYPL-FLO
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1—For 24 IN. & — FOR 30 or 36 IN.
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STANHOPE, 68 E. 42nd St.,
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REBUILT PAVER

One 34E Ransome Dual Drum Paver, Gasoline Powered, Completely rebuilt.

Immediately Available
\$17,500.00

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Model E Quick Way Crane—4/10 Cu. Yd.—Mounted on K8—6x6 International Truck—Equipped as Crane, Dragline, Backhoe, 40 foot of Boom with Jib.

LaCrosse Ten Ton Tilt Trailer.
Three Yard—Two Wheel Gar Wood Hydraulic Scraper.

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Used road grader. Galion IHC hydraulic control Model G16724A. International engine. All 6 tires in excellent condition. Road grader shows little wear.

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FOR SALE

- 3—D7 Tractors with LeTourneau cable dozers, very good condition. \$3900.00 each.
- 1—D7 No. 1 6040 with LaPlant-Chouteau Hydraulic straight and angle dozer, like new. \$9850.00.
- 1—8-Ton Locomotive.
- 300 Amp. MG 220/440 Volt Welders \$350 up.

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Byers crawler crane $\frac{5}{8}$ yd. Model 128, Serial #4001. In operating condition. Can be inspected at Red Top Trucking Co., 7530 Calumet Ave., Hammond, Ind.

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FOR SALE

- 1—Barber-Greene Model 14 ditcher with Wisconsin 4-cylinder engine. Good condition. \$5,500.00.
- 1—Woodbridge Model TCR scraper 14-18 cu. yd., good condition. \$1,000.00.
- 2—Allis-Chalmers HD-14 tractors, straight bulldozer blades, double drum power control units, with General Motors 671 diesel engine. \$6,500.00.
- 1—Link Belt Speeder LS-50 Combination Shovel & Trancheur, $\frac{1}{2}$ yd. dipper. Good Condition. \$5,300.00.
- 1—Hough Payloader 1 cu. yd. bucket, Dual tires. Good condition. \$4250.00.

WILSON MACHINERY & SUPPLY COMPANY
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One D4 Angle Hydraulic Blade, with Hyster Winch, new rollers, new swing frames, in nice shape. price.....\$5,000

One Ingersoll Rand Wagon drill, extra fine condition, Model FM2. price...\$1,200

Southwest Coal Company
Phone 271
RICHLANDS, VIRGINIA

FOR SALE**SEVENTEEN (17) BOTTOM DUMP EUCLIDS**

13 Cubic Yard Capacity—Model 25FDT. 150 H. P. Cummins Diesel Engines. New 1947—1948—1949, First Class Condition—90% Rubber.

ONE (1) EUCLID LOADER—MODEL BV5

150 H. P. Cummins Diesel Engines. Machine & Belt in good condition.

All located Wolf Creek Dam, Jamestown, Ky.

As is—Where is—Subject to Prior Sale.

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- 14—Trucks 1946 to 1949 $\frac{1}{2}$ ton to 2 ton.
- 6—Heavy Duty Winches with Power Take-Off
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- 1—1948 D-4 Traxcavator
- 3—1947 HD-14 Bulldozers with Cargo Winch
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805 Koehring crane drag diesel
65 Bay City crane drag hoe, diesel
 $\frac{1}{2}$ Yd. Northwest truck crane
Backhoe for Marion Model 352
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Shovel front for Lorain Model 30, New
Hercules front for Michigan $\frac{3}{4}$ yd.
Hercules Gas Engine for Bay City Model
62 or 65, complete with gear train.

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FOR SALE

1—HDS with Baber hydraulic dozer. Machine just like new. 8000 actual hours.
1—YDS with Bucyrus-Erie loader, high speed reverse, in excellent condition.
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IN STOCK**NEW EQUIPMENT—**

- 1—Osgood Model 202-10 ton Half Yard Truck Crane on Richardson Carrier
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- 1—Warco Model 4D-76 Motor Grader
- 1—American Model 6H Motor Grader
- 1—Huber Maintainer
- 1—M-M Tractor Model RT1 with Lull Loader

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- 1—2 $\frac{1}{2}$ ton Littleford Roller
- 1—A-C Patrol Grader with Loader
- 1—A-C Highway Patrol Grader
- 1—Maiss Bucket Loader on cats
- 1—10 ton Hercules 3 wheel Roller
- 1—Ford Tractor with Loader
- 1—HD7-AC Bulldozer w. 4 yd. Letourneau Scraper
- 1—110 ft. Davey Portable Compressor

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FOR SALE

TD-18 Bull Dozer, with heavy duty Lufkin Winch. Good condition \$4,950.00
P&H 255A Dragline, Excellent condition \$7,350.00
Northwest Model 7 Dragline—2 yard machine. Excellent condition \$15,000.00
2—Three Yard Yaun Dragline Buckets, New, never been used each \$875.00

One Steam Pile Driver, complete with Hammer.
All draglines listed above equipped with diesel motors. Contact:

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We Own and Offer for Immediate Delivery from Stock:

- 1—Clyde Whitley, barge-type, diesel, elect. full revolving, 85' boom @ 15' whip, rated 30 T @ 40' radius, 12 T @ 95' radius. Complete specifications and price on request.
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- 1—2 drum A.H.A.D. mod. 180' 180000 SLP @ 240 FPM w/6 cyl. Waukesha eng. \$6000.00
- 1—3 drum A.H.A.D. steam, waterfall type, 18x12, 13500 SLP @ 250 FPM, skeleton type frame, contractors' hoist. . . \$4500.00
- 1—3 drum A.H.A.D. steam, waterfall type, 7½x10, 7500 SLP @ 200 FPM, skeleton type frame, contractors' hoist. . . \$1750.00
- 1—2 drum I.B. slusher hoist, 5700 SLP @ 200 FPM, 4 cable rollers ea. drum, w/ 35 HP 3/80/220 440 volt motor. \$1950.00
- 1—Int. US power unit, skid mid., rod, cooled, disc clutch, pulley. . . . \$750.00
- 1—10x36 Cedar Rapids roller bearing jaw Crusher w/motor & start. All steel base, manganese jaw and cheek liners \$4500.00
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- 3—300 KVA trans., OISC, 22000/19800/11000/5800, 2400 480 (3) \$2850.00
- 3—300 KVA. trans., OISC, 4140V/23000/2400Y/1430D (3) \$2850.00
- 2—Worth, vert. Simp. steam pumps 8x5x12, each. . . . \$400.00
- 2—Worth, vert. Simp. steam pumps 7x7x12, each. . . . \$325.00
- 1—G-D pump, 8" sucl., 3" disch., cent., 1000 GPM @ 280' hr. dir. conn. to Buda diesel engine, skid mid. . . . \$2650.00

All offerings subject to prior sale or other disposition. All prices f.o.b. our warehouse.

Commercial Equipment Co.

2937 Ford Street, Keller, 2-8130
OAKLAND, 1, CALIFORNIA

EQUIPMENT BARGAINS

- 2 Model "W", LeTourneau Scrapers with 1800 x 24 Dual Tires. Excellent tires. Good condition. Price. . . . \$6,500.00
- 1 #12 Caterpillar Diesel Motor Grader, Serial Number 9K1318. Price. . . . \$7,200.00
- 1 Mandt Swing Loader, ½ cubic yard Bucket, used as demonstrator. Price. . . . \$5,000.00
- 1 Three Quarter yard Link-Belt shovel front for LS85 Speeder, complete with Manganese dipper, looping cable, positive chain crowd, and power trip, used two weeks—New guarantee. Price. . . . \$3,200.00

All Prices Quoted F.O.B., Rapid City

West River Equipment

Caterpillar for Western South Dakota

417 Pine Street
RAPID CITY, SOUTH DAKOTA

ELECTRIC GENERATORS

CATERPILLAR D-13000 ELECTRIC SET—2-V Series—2 units synchronized. Mounted on 4-wheel trailer W-675 gallon fuel storage tank and Louis-Allis Generators. 220-440 Volt—60 Cycle—3 Phase—104 KVA—83 KW. Will sell as set or as separate units. Complete \$15,000.00—no separate units, \$7,500.00 each. Guaranteed to be in A-1 condition.

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16 Cu. Yd. End Dump Semis W/Tractors

11 - 16 cu. yd. Utility Model SWX15 End Dump Semi Trailers w/twin telescopic hoists and drawn by Model 355DT Peterbilt Tractors powered by Model 400 Hall-Scott Engines. Tires 1100x22.

Price each - So. San Francisco. . . . \$10,000.00

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Cleaver-Brooks one-car Tank Car Heater, mounted on 1939 Ford Truck. Both units in excellent operating condition. 1952 Boiler Inspection.

Price—\$750.00

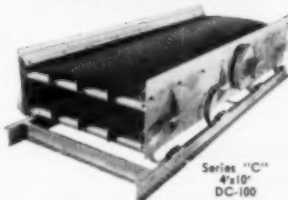
Inspection may be made at our garage, Route 145, Cairo, New York

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Series "C"
4'x10'
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KOLMAN's new Series "C" screens deliver vigorous action to give high capacity and more accurate sizing—yet "floating" action that prevents transmission of damaging vibrations to attached equipment. You save on initial cost, save on operating expense, get an all-around "better shake" with a KOLMAN. Write today for FREE folder illustrating single and multi-deck models.



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4000 Gal. Tandem Tank Trailer. Complete with pumping unit, etc., \$2,500.00

2000 Gal. Single Axle Tank Trailer \$750.00

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3—DW-10 Caterpillar Wagons.

5—Super "C" Tournapulls

1—Model 6 Northwest Crane.
New and Used 105 to 315
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Used Steel I Beams—¾" web
4—20" h., 8" fl., 16' L.
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2—24" h., 7¾" fl., 24' L.
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4—21" L., 14" w.

All in good condition
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NEW Cast Iron Water Main Pipe

Bell & Spigot—super De Luvand Mfg. by U. S. Pipe & Foundry Co.

150 Pcs. 16 inch O.D. x 16 ft. Class 200.
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- 1—Steel Spud, 1" wall, 22" O.D., 55' long with point and head sheave.
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 5 Caterpillar D8 Tractors. 2U series
 Manitowoc 2000 Crane 1½ yd 80 ft bm
 65 ton Whitcomb Diesel Elec. Locomotive
 8¼x10 Clyde 3 Drum Steam Hoist
 Rex 200 Single Pumpcrete. Gas powered
 Northwest 80D 2½ yd Diesel
 Combination

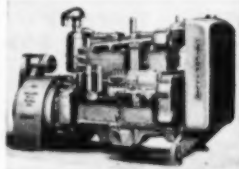
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Slusser-McLean 8-10 yd. cable scraper. New.

LeTourneau J8 scraper.

P & H ¾ yd. Backhoe (new).

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JOHNSON 300 bbl. overhead silo, two 1 c.y. batchers, undertrack screw, 400 bbl. storage silo.

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(Crushing & Screening Equip.)

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Backhoe attachment for B.E. 228.

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D2 w/ Traxxon cable loader.

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A complete stone crusher plant. Give details as to the capacity, make, and age of crushers, conveyors, screens and bins, etc. Also, please give location. Write Box 1090, Roads and Streets, 22 W. Maple St., Chicago 10, Ill.

FOR SALE

- 7—D-8 Caterpillar tractors 2U series equipped Caterpillar model 25 DDPCU and Caterpillar bulldozer.
- 1—Caterpillar Patrole model 12 in 9K series.
- 2—Caterpillar DW10 tractors equipped 5700 gallon water wagons.
- 3—TD24 International crawler tractors equipped Bucyrus DD-PCU and push blocks.
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- 18—13 yard bottom dump Euclid model 43 FDT. Powered 671 GMC engine.
- 10—Euclid bottom dump trailers 13 yd. capacity model 58W. Equipped with tandem hitches to run in tandem with next above item.
- 2—Linas model 1201 combination shovel dragline. 3 1/4 yard dipper. 100 ft. boom. Kohler light plant. Powered 1879 Buda Engines.
- 1—Lima model 1201 crane. High gantry 100 ft. boom. Kohler light plant. Powered Cummins model L engine.
- 1—Marion Model 111M 3 1/4 yd. shovel dragline combination. Kohler light plant. Powered Twin GMC engines 671.
- 1—Marion model 111M Dragline. Kohler light plant. Powered model L Cummins engine.
- 1—Marion model 151 M Electric 6 1/2 yd. shovel dragline combination. Ward Leonard controls. Machine sectionalized for quick dismantling.
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- 4—KB 14 International trucks with 8 yd. heavy duty rock dump bodies.
- 4—Cement batch plans. C. S. Johnson: 300 bbl. overhead storage, electric or gasoline powered. 2 one-yd. batchers with electric dial scales or beam scales, with railroad unloading screw and truck hopper, each with 400 bbl. silo.
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Euclid Trucks 15 Ton—22 Ton End Dump—15 Yd. and 25 Yd. Bottom Dumps—12—23 Yd. Bot. Dump without tractors.

4—Elec. Std. Ga. Dump Car Incomotive—600 volt with 12—616, 68 air dump cars—25,000 lb. cap. 130 Cu. Ft. Incl. with all elec. equip. Gooden 10 Ton Mine Loco—250 Volt 36" Gauge. Ottumwa Mine Haul—15" Rope—200 H.P. Motor—525 R.P.M. complete. Jaw Crushers 36" x 48" Nordberg—36" x 48" Farrel—60" x 48" 42" x 48" 42" x 36" 24" x 36" 18" x 36" 18" x 36" Symons Cone 5 1/2—4—3—2—60 x 40 Disc Hammer mill—54" Trolley Type T—42" McCully—48" Gyroscopes.

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4 Caterpillar D7 3 Caterpillar D4 31 Allis-Chalmers MD 10 3 Allis-Chalmers MD 10

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- 3 Bucyrus Erie 15B Draglines 1-yd.
1 Insley K12 Crane, 1/2-yd.
1 Insley K12 Backhoe, 1/2-yd.
1 P & H Dragline, 1/2-yd.
1 Ray City 18A Tractor, 1/2-yd.
1 P & H 258A Crane, 1/2-yd.
1 Byers 83 Shovel, 1/2-yd.
1 Northwest 25 Crane, 1/2-yd.
1 Koshing 30A Crane, 1/2-yd.
1 Link-Belt L883 Crane, 1/2-yd.
1 Keyhole 18A Crane, 1 yd.
1 Northwest 88D Barge Mount Dragline, 2 1/2-yd.

MISCELLANEOUS

- 3 EC 31 Athey Dump Trailers
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Cat. D-6 Late 1846 Hrs. Bargain
Duo-Way Scoop

1 1/2 cu. yd. Bucket Demonstrator

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1—INSLEY Model K-12 shovel w/
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T. L. Smith Model 27-E Concrete Paver.
1 cu. yd. cap. operated by 6 cylinder
Waukesha gasoline engine, mounted
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KINNEY Spring Steel DRAG Broom

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On mold-boards for heavy shoulder sweeping. As flexible grader blade and for contouring highways under construction.



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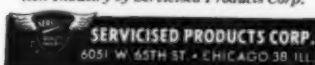
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MANUFACTURERS' LITERATURE

29

Steel Utility Buildings

USF all-steel utility buildings are fully described and illustrated in a new 8-page booklet of United Steel Fabricators, Inc. Illustrations show various styles and applications of the USF prefabricated structures, and steps in erection. Descriptive matter includes a section on design features, full specifications, complete details of the exclusive USF clip-and-wedge assembly, and drawings of the six standard wall panels, together with information on how to plan your own building. One page is devoted to the USF handy hut, a small portable-or-permanent steel utility building.

For further details circle number of this item on Readers Service Card.

30

Surface Material Spreaders

A new catalog (Bulletin F-130) describing the many features of the recently introduced Buckeye Model 5 spreader has been announced by Gar Wood Industries, Inc., Findlay Division. Some of the design and construction features highlighted are the controlled volume and rate of spread. The rate of spread is uniform regardless of the truck speed as the feed roll is powered from the spreader wheels. Feed roll can be adjusted to permit a tapered spread of material. Built in three sizes, the No. 5 spreader can be used for base course spreads by using a strike-off attachment. The catalog also explains the complete line of spreader attachments.

For further details circle number of this item on Readers Service Card.

31

Hydraulic Lift

A new, two-color brochure, illustrating and detailing uses of the Century "1000" manually propelled hydraulic lift, has been issued by Century Products Co. The brochure outlines applications and economies of the 1000-lb. capacity lift, describes construction features, hydraulic pump operation and lists specifications on material and design.

For further details circle number of this item on Readers Service Card.

32

Trenching Machines

A new 4-page bulletin describing its special "Pipeline Trenchliner" has been issued by Parsons Co., a subsidiary of Koehring Co. Designated as the Model 215 Trenchliner, this new wheel type unit digs in a range of 30 digging feeds, from 6.2 in. to 18 1/4 ft. per minute, 13 to 31 in. wide and up to 6 ft. deep.

For further details circle number of this item on Readers Service Card.

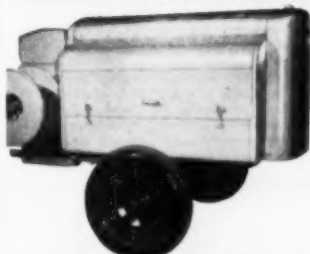
33

Water Repellent

A new 4-page product manual on "Silaseal," a silicone type transparent water repellent, has been announced by Surface Protection Co. This instructive booklet describes the uses and application of this silicone development and tells how po-

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COMPRESSED AIR
FOR LESS with

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COMPRESSORS



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You can reduce costs today, by using a Smith 105-P for the majority of your compressor work! Delivers 105 cu. ft. per minute — combines heavy duty with light weight; easily portable. Chrysler Ind. 15 Engine has 6 cyl., 4" bore, 5" stroke, 377 cu. in., 3" crankshaft, 7 main bearings, sodium cooled valves and Stellite valve seats for heavy duty, long life. Compressor valves — stainless steel disc type with Manganese Bronze seats. Improved type pilot valve and simplified control.

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rous exterior masonry surfaces can be successfully treated so that they are completely water repellent. Highlighted in the literature is a section devoted to the control and elimination of efflorescence.

For further details circle number of this item on Readers Service Card.

34

Lubrication and Maintenance Guide

The revised 4th Edition of the Gulf Oil Corporation's lubrication and maintenance guide for contractors' equipment is ready for distribution. Called "Lubrication & Maintenance Guide for Contractors' and Allied Equipment," this handy pocket-sized booklet contains 96 pages of up-to-date information on the lubrication and maintenance of equipment for quarries, crushed stone plants, sand and gravel plants, asphalt plants, and ready-mixed concrete suppliers, in addition to contractors' equipment. The new guide deals with some 45 separate and distinct lubrication and maintenance items such as engine types, engine lubrication, air cleaners, oil filters, care of carburetors and ignition systems, anti-freeze requirements, correct valve maintenance, diesel fuel injection equipment, chassis lubrication, steering gears, power brakes, and hydraulic systems. The booklet also contains valuable information on the storing of equipment and the removal of equipment from storage, care of tires, dust control, storage battery maintenance, and the storage and handling of petroleum products. The lubrication and maintenance of air compressors, air tools, open gears, wire rope, shovels and draglines, conveyors and elevators, and crush-

ers are also covered in the guide. Of particular interest to owners and operators of equipment are the sections in the guide dealing with A.P.I. classification of motor oils and the recommended oil for use under prescribed conditions, S.A.E. viscosity numbers for crankcase oils, and the S.A.E. transmission and axle lubricant classifications.

For further details circle number of this item on Readers Service Card.

35

Shock Absorber

A 4-page bulletin, issued by Greer Hydraulics, Inc., tells how to absorb shocks on hydraulically operated bucket loaders, power shovels and other equipment by means of hydro-pneumatic accumulators. A Greer accumulator consists of a steel shell containing a rubber bag precharged with gas. Hydraulic fluid forced into the shell through an oil port compresses the bag. Thus any sudden impact against the hydraulic fluid in the system forces oil into the shell where it is cushioned by the gas in the bag. Bulletin contains illustrations and descriptions of the accumulator and an installation diagram.

For further details circle number of this item on Readers Service Card.

36

Classifiers

A new bulletin on sand drag type dehydrators has been issued by Pioneer Engineering Works. It explains the operation of the dehydrator and includes a cutaway drawing showing construction features. Complete specifications and capacities are listed.

For further details circle number of this item on Readers Service Card.

37

Concrete Construction Equipment

The complete line of concrete construction equipment of Heltzel Steel Form & Iron Co., and The Flexible Road Joint Machine Co. are covered in a 20-page bulletin. Illustrated and described are stationary batching plants, forms for airport paving, portable aggregate plants, portable bulk cement plants, batchers for portable bins, automatic batchers, sub-grade machines, finishing machines, mechanical dowel and tie-bar installer, joint machines, joint materials and accessories, bridges for concrete paving, and automatic curing machine.

For further details circle number of this item on Readers Service Card.

38

Ditch Bridges

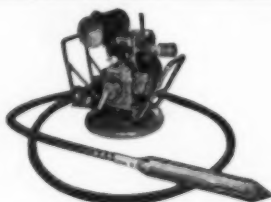
"Ditch Bridge," a new, time and labor saving magnesium bridge designed especially for supporting trucks and other similar rubber-tired vehicles over ditches, is described in Bulletin DB-1-452, released by Magnesium Products. Bulletin covers applications, load limits and dimensions. A convenient specification sheet—order blank has been included in the bulletin.

For further details circle number of this item on Readers Service Card.

39

Road Reclamation Method

A new, 24-page booklet, "The Athey Method of Reclaiming Worn-Out Roads," giving detailed information on a new economical method of road re-building using existing materials in worn-out



Only White Vibrators Have All These Features

Which have made them successful all over the world.

All Flexible Drive Sections are Interchangeable.

No special sections, or expensive extra couplings needed. Each casing has ball bearing connector.

No Limit to Length of Flexible Drive.

Each driving core has slip joint which does not separate in service. Prevents stretching.

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roads, has been made available by Athey Products Corporation. The profusely illustrated book gives a step-by-step procedure for reclaiming bituminous and gravel roads and streets, plus useful production data, rock hardness charts, cost estimates and actual job costs. Much of the factual information, contained in the 2-color booklet, was obtained from actual projects across the nation. The booklet is not intended for general advertising distribution, as it is a complete instruction manual-type of book. Contractors, state, county or city officials, or any person actually engaged in road re-building, can obtain a copy.

For further details circle number of this item on Readers Service Card.

40

Tractor Tools

A comprehensive guide illustrating the use of tractor-mounted tools in all basic industries such as construction, railroad, mining, light and heavy logging, farming, oil and gas and governmental projects, has been released by Hyster Co. Printed in four colors, the brochure uses a cartoon-style which presents many of the principal uses for this type of equipment.

For further details circle number of this item on Readers Service Card.

41

Tractor Maintenance Guide

Maintenance practices are simplified for operators of Cat. DW21, DW20 and DW10 Tractors in a multi-colored cartoon type booklet issued by Caterpillar Tractor Co. The 24-page handbook (Form 30275) will be published in English,

French, Spanish and Portuguese. Using scenes familiar to the operator, the booklet discusses factory-prescribed techniques in caring for Caterpillar wheel-type Tractors. Reduction of repair bills and elimination of "down time" is the purpose of the booklet which deals with many specific procedures in connection with routine Caterpillar engine maintenance.

For further details circle number of this item on Readers Service Card.

42

Weed Control

A new service bulletin on the uses and application of Penite 6, a non-selective weed killer, has been prepared by the Agricultural Chemicals Department of Pennsylvania Salt Manufacturing Co. Instructions are given in the bulletin for top growth and aquatic weed control and also explanations of the methods to be employed in soil treatment for the complete kill of weeds and grasses. Penite 6 is also a control agent for termites, and formulations are furnished for preparing the proper solution for this use. The bulletin contains recommendations for use of Penite 6 for killing of trees and stumps.

For further details circle number of this item on Readers Service Card.

43

Power Sweeper

The Model 24 power sweeper is illustrated and described in a 2-page circular issued by G. H. Tennant Co. This sweeper is powered by a 4.4 hp engine and has low gear speeds from 2 to 3.5 mph, high gear to 8 mph. It has a specially de-

signed brush and vacuum system. In addition to its uses for industrial purposes, it is used by highway contractors on permanent joint resealing jobs for sweeping up old seal, dirt and debris removed from old pavement joints.

For further details circle number of this item on Readers Service Card.

44

Slip-On Fittings for Pipe Work

Nu-Rail slip-on fittings claimed to simplify structural pipe work with savings up to 80% on labor are featured in a 8-page circular issued by The Hollander Manufacturing Co. The fittings are illustrated and described and pictures are given of various installations including bridge railings. One page of engineering data is included.

For further details circle number of this item on Readers Service Card.

45

Screens, Rock Drills, Vibrators

A 52-page miniature catalog No. 525 providing pertinent data in condensed form on its entire line of equipment has been issued by Syntroon Co. Listed in the catalog are vibratory feeders, vibrating grizzlies and screens, electric hammers, electric saws, gas hammer breakers and rock drills, concrete form vibrators and floats, concrete mass vibrators and diesel pile hammers.

For further details circle number of this item on Readers Service Card.

46

Hauling Trailers

A new 4-page, 2-color cartoon style booklet describes the complete line of

RUEMELIN BLAST GENERATORS

FOR CLEANING BRIDGES— WATER TOWERS—STRUCTURAL STEEL



Many contractors use Ruemelin Blast Generators for cleaning steel work to remove rust, paint and scale before repainting. These machines are also used to remove laitance from cement wherever concrete construction is in progress. A wet adapting nozzle can be furnished to convert dry machines to wet type of operation. Built in several sizes.

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Bulletin 36-C

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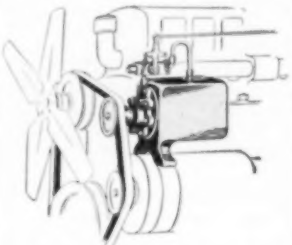
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rubber-tired trailers of Athey Products Corporation. Describing the PD-20, PD-10Q and PD-10P, the booklet has over 15 illustrations and carries a theme of two contractors discussing job applications and products.

For further details circle number of this item on Readers Service Card.

47

Bituminous Distributors

A new catalogue, issued by the Gunnison Manufacturing Co., contains in addition to a detailed description of the Gunnison asphalt distributors an announcement of the development of the new Gunnison air-snap spray bar shutoff control. This is a series of valves at the spray bar which are closed and opened simultaneously by compressed air. Each series of valves is constructed in sections 3 ft. in length. Operated by a finger tip control on the operator's platform, the shut-off and starting action is performed in a split-second. In consequence, it is stated, there is absolutely no dripping of the asphalt and the starting and finishing lines of a bituminous treated road section are sharp and clean. The air-snap valves are also installed on the Gunnison swing bar extensions. These extensions are hinged to swing back without damage if the bar strikes a post or other obstacle.

For further details circle number of this item on Readers Service Card.

48

Tool and Die Welding

The fourth of a series of "How-to-Weld-It-Better" manuals, "Tool & Die Salvage Welding," a 64-page, profusely illustrated book on latest welding developments and techniques in this specialized field, is offered by Eutectec Welding Alloys Corporation. Over 100 photos, drawings, charts and diagrams are devoted to a detailed discussion of more efficient and more widespread usage of improved tool and die welding procedures. Contents are arranged under such descriptive chapter headings as: Problems in Welding Tool Steels; An Effective Tool and Die Welding and Salvage Program; Tool Which Can Be Successfully Welded and Salvaged; New Methods in Production Welding of Tools; etc.

For further details circle number of this item on Readers Service Card.

49

Gas Burner Nozzles

A new catalog, 804-C, covering its latest enlarged line of "Retain-A-Flame" gas burner nozzles for industrial heat processing applications, has been issued by Hauck Manufacturing Co. Capacities and other data are given on the 10 sizes of straight and 9 sizes of elbow type nozzles now available. Spark and gas pilot ignition are explained. Hauck Manufacturing Co., Dept. R-S, 124-136 Tenth St., Brooklyn 15, N.Y.

For further details circle number of this item on Readers Service Card.

50

Concrete Curving Papers

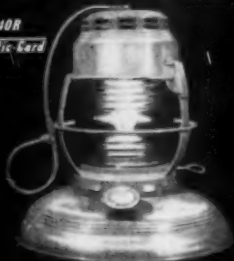
Reinforced, waterproof papers meeting federal specifications are described in a new illustrated folder issued by Angier Corporation. Included are suggestions for re-use of these extra strong concrete curving papers for other construction needs. Angier Corporation, Framingham, Mass.

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Lighthouse Lens

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Traffic Card



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WITH THE MANUFACTURERS & DISTRIBUTORS

Smith Engineering Works Promotions. Alexander Lorn Munro, for many years chief engineer of The Smith Engineering Works, Milwaukee, Wis., has been advanced to the position of director of engineering. He also is secretary and a director of the company. Elmer E. Kraig, formerly assistant chief engineer has been advanced to the position of chief engineer.

Appointed Export Managers. Melvin Pine & Co., Inc., 80 Broad Street, New York 4, N. Y., have been appointed the exclusive export department to promote the sale of the Acme Road Machinery Co. equipment in markets all over the world. The Acme Co., Frankfort, N. Y., has been in existence since 1900 and manufactures 6, 8, 10 and 12 ton road rollers, ore and rock crushers, and sand and gravel screening and washing plants.

H. J. Meeker Retires. Herbert J. Meeker, assistant to T. Cruthers, vice president Worthington Corporation, Harrison, N. J., retired July 1 after 50 years' service with the company.

Carruthers Promoted. Robert C. Carruthers has been appointed assistant

sales manager, welding products, of American Steel Division, American Brake Shoe Co. at Chicago Heights, Ill.

New Euclid Distributors. Cunningham-Ortmayer Co., Milwaukee, Wis., has been appointed distributor by The Euclid Road Machinery Co., Cleveland, O., for the state of Wisconsin. Butler-Sparks Co., Oklahoma City, Okla., will represent Euclid in the state of Oklahoma.

Universal Atlas Personnel Changes. Joseph R. Lair, district sales manager of the Indiana-Michigan territory of Universal Atlas Cement Co., Chicago, Ill., has retired after more than 37 years' service with the company. Auwell Fogarty, assistant district sales manager, has been appointed district sales manager succeeding Mr. Lair.

Ginther Made General Sales Manager. A. W. Ginther has been appointed general sales manager of Wood Manufacturing Co., North Hollywood, Calif. He formerly was Los Angeles district manager for Harnischfeger Corp.

Robinson Joins Viber Co. J. A. Robinson, formerly Western Editor of Electrical World, has been appointed sales manager of Viber Co., Burbank, Calif.

Ziegenhagen Joins Worthington. M. E. Ziegenhagen has been appointed advertising and sales promotion manager of Worthington Corporation, Harrison, N. J. Mr. Ziegenhagen formerly was in charge of advertising and sales promotion for several of the products departments of General Electric's Schenectady plant.

Opens New Offices. Penn Metal Co., Inc., Boston, Mass., has opened new offices at 1025 Connecticut Ave., Washington, D. C., under the management of Cecil R. Carley.

Territorial Changes by Nordberg. T. D. Davis, as western branch manager, Crusher and Process Machinery Divisions, Nordberg Manufacturing Co., Milwaukee, Wis., has been placed in charge of the company's west coast operation including its northwest territory formerly under the jurisdiction of G. E. Jarpe, who has been transferred to Duluth, Minn., as district manager of the north central territory.

Meili-Blumberg Acquires Hough Sweepers. The Meili-Blumberg Corporation, New Holstein, Wis., has acquired The Frank G. Hough Co. line of tractor sweepers and will now distribute as well as continue the manufacture of all such sweepers under the M-B trademark.

VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE in a complete line of sizes to fit all standard compressed air hammers.

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are manufactured for all crawler type tractors. Teeth are removable and replaceable and are capped with manganese wear points. Tooth spacing changeable to suit job at hand. Pusharms are optional, may be ordered to fit any standard pusharm.

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experienced riggers demand
GENUINE

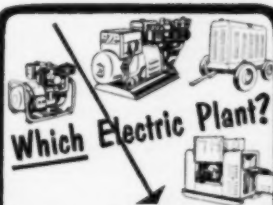
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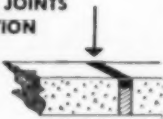
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**WILL KEEP THE JOINTS
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**...FOR YEARS
AND YEARS!**



You can't win... when roadway joints are poured with ordinary materials.

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... It's filled with good ideas for construction and industrial men.

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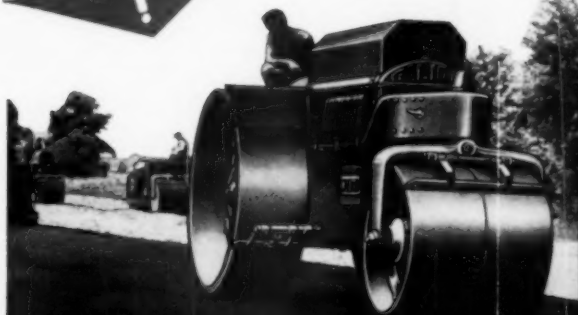
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**FINISH
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!**



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